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METHOD FOR GENERATING A RANDOMIZED
FLIGHT-BY-FLIGHT LOADING SEQUENCE
FOR AN AIRCRAFT

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JULY 1980

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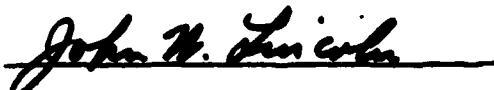
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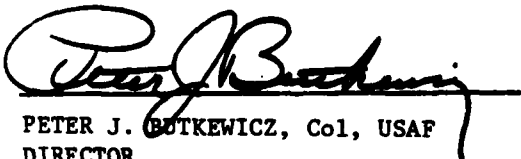


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specific mission profile. In both cases the flight portion is divided into intervals to account for separate phases of the mission and weight changes during flight. In addition an aircraft temperature profile associated with the mission is randomly sampled to provide a flight-by-flight temperature sequence. To provide more flexibility in deriving the flight-by-flight sequence the mission time can be obtained by a random sampling. The computer program for generating the flight-by-flight sequence is included along with a sample problem.



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FOREWORD

This report was prepared by John W. Lincoln, Structures Division of the Directorate of Flight Systems Engineering. The work was done as a research and development task for general use for generating flight-by-flight loading spectra for aircraft.



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LIST OF SYMBOLS

N_p	Number of control points on the aircraft structure used in deriving the fatigue test spectrum
N_m	Number of different missions flown by the test aircraft in its life
σ_{R}^{ab}	Stress at the ath control point for the aircraft resting on its landing gear ready to fly the bth mission.
M_{TT}^{ab}	The number of different stresses in the maximum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
σ_{TT}^{ab}	A simple graph, the ordinates of which are members of the maximum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
n_{TT}^{abm}	A simple graph whose ordinates are the number of take-off taxi load maximums during one lifetime for the stresses contained in σ_{TT}^{ab} before the mth random sampling
n_{TT}^{abm}	The sum of the ordinates of n_{TT}^{abm}
n_{TT}^{abm}	A simple graph derived from n_{TT}^{abm} whose ordinates are the selection candidates in the random sampling process
M_{TT}^{ab}	The number of different stresses in the minimum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
σ_{TT}^{ab}	A simple graph, the ordinates of which are members of the minimum take-off taxi stress spectrum for the ath control point of an aircraft flying the bth mission
n_{TT}^{abm}	A simple graph whose ordinates are the number of take-off taxi load minimums during one lifetime for the stresses contained in σ_{TT}^{ab} before the mth random sampling

n_{TT}^{abm}

The sum of ordinates of n_{TT}^{abm}

n_{TT}^{abm}

A simple graph derived from n_{TT}^{abm} whose ordinates are the selection candidates in the n random sampling process

N_S^b

The number of mission intervals (in flight) in the b th mission

M_F^{abc}

The number of different stresses in the maximum flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

F_p^{abc}

A simple graph, the ordinates of which are members of the maximum flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

n_F^{abcm}

A simple graph whose ordinates are the number of flight load maximums during one lifetime for the stresses contained in σ_F^{abc} before the m th random sampling

n_F^{abcm}

The sum of the ordinates of n_F^{abcm}

n_F^{abcm}

A simple graph derived from n_F^{abcm} whose ordinates are the selection candidates p in the random sampling process

M_F^{abc}

The number of different stresses in the negative g flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

σ_F^{abc}

A simple graph, the ordinates of which are members of the negative g flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

n_F^{abcm}

A simple graph whose ordinates are the number of flight negative g loads during one lifetime for the stresses contained in σ_F^{abc} before the m th random sampling

n_F^{abcm}
 n_T

The sum of the ordinates of n_F^{abcm}

n_F^{abcm}
 n

A simple graph derived from n_F^{abcm} whose ordinates are the selection candidates n in the random sampling process

M_F^{abc}
 g

The number of different stresses in the one g flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

σ_F^{abc}
 g

A simple graph, the ordinates of which are members of the one g flight stress spectrum for the a th control point of an aircraft flying the c th mission interval of the b th mission

n_F^{abcm}
 g

A simple graph whose ordinates are the number of flight one g load during one lifetime for the stresses contained in σ_F^{abc} before the m th random sampling

n_F^{abcm}
 g_T

The sum of the ordinates of n_F^{abcm}

n_F^{abcm}
 g

A simple graph derived from n_F^{abcm} whose ordinates are the selection candidates g in the random sampling process

M_L^{ab}
 i

The number of different stresses in the landing impact stress spectrum for the a th control point of an aircraft flying the b th mission

σ_L^{ab}
 i

A simple graph, the ordinates of which are members of the landing impact stress spectrum for the a th control point of an aircraft flying the b th mission

n_L^{abm}
 i

A simple graph whose ordinates are the number of landing impact loads during one lifetime for the stresses contained in σ_L^{ab} before the m th random sampling

n_L^{abm}
 i_T

The sum of the ordinates of n_L^{abm}

$n_{L_i}^{abm}$	A simple graph derived from $n_{L_i}^{abm}$ whose ordinates are the selection candidates in the random sampling process
$M_{LT_p}^{ab}$	The number of different stresses in the maximum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{LT_p}^{ab}$	A simple graph, the ordinates of which are members of the maximum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{LT_p}^{abm}$	A simple graph whose ordinates are the number of maximum landing taxi loads during one lifetime for the stresses contained in the $\sigma_{LT_p}^{ab}$ before the mth random sampling
$n_{LT_{p_T}}^{abm}$	The sum of the ordinates of $n_{LT_{p_T}}^{abm}$
$n_{LT_p}^{abm}$	A simple graph derived from $n_{LT_p}^{abm}$ whose ordinates are the selection candidates in the random sampling process
$M_{LT_n}^{ab}$	The number of different stresses in the minimum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{LT_n}^{ab}$	A simple graph, the ordinates of which are members of the minimum landing taxi stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{LT_n}^{abm}$	A simple graph whose ordinates are the number of minimum landing taxi loads during one lifetime for the stresses contained in $\sigma_{LT_n}^{ab}$ before the mth random sampling
$n_{LT_{n_T}}^{abm}$	The sum of the ordinates of $n_{LT_{n_T}}^{abm}$

n_{LT}^{abm}	A simple graph derived from n_{LT}^{abm} whose ordinates are the selection candidates in the random sampling process
M_F^{abc}	The number of different temperatures in the flight temperature spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission
T_F^{abc}	A simple graph, the ordinates of which are members of the flight temperature spectrum for the ath control point of an aircraft flying the cth mission interval of the bth mission
n_F^{abcm}	A simple graph whose ordinates are the number of flight temperature occurrences during one lifetime for the temperatures contained in T_F^{abc} before the mth random sampling
n_{FT}^{abcm}	The sum of the ordinates of n_F^{abcm}
n_F^{abcm}	A simple graph derived from n_F^{abcm} whose ordinates are the selection candidates in the random sampling process
$M_{TG_i}^{ab}$	The number of different stresses in the touch-and-go landing impact stress spectrum for the ath control point of an aircraft flying the bth mission
$\sigma_{TG_i}^{ab}$	A simple graph, the ordinates of which are members of the touch-and-go landing impact stress spectrum for the ath control point of an aircraft flying the bth mission
$n_{TG_i}^{abm}$	A simple graph whose ordinates are the number of touch-and-go landing impact loads during one lifetime for the stresses contained in $\sigma_{TG_i}^{ab}$ before the mth random sampling
$n_{TG_iT}^{abm}$	The sum of ordinates of $n_{TG_i}^{abm}$
$n_{TG_i}^{abm}$	A simple graph derived from $n_{TG_i}^{abm}$ whose ordinates are the selection candidates in the random sampling process

M_{TG}^{ab}

The number of different stresses in the touch-and-go landing one g stress spectrum for the ath control point of an aircraft flying the bth mission

σ_{TG}^{ab}

A simple graph, the ordinates of which are members of the touch-and-go landing one g stress spectrum for the ath control point of an aircraft flying the bth mission

n_{TG}^{abm}

A simple graph whose ordinates are the number of touch-and-go landing one g loads during one lifetime for the stresses contained in σ_{TG}^{ab} before the mth random sampling

$n_{TGg_T}^{abm}$

The sum of ordinates of n_{TGg}^{abm}

n_{TGg}^{abm}

A simple graph derived from n_{TGg}^{abm} whose ordinates are the selection candidates in the g random sampling process

SECTION I

INTRODUCTION

It is now generally accepted that flight-by-flight fatigue testing is more representative of service experience than block type testing. Further, it appears that load randomization within a flight corresponds reasonably well to flight time history measurements. The purpose of this report is to provide a computer technique to transition from exceedance data for various phases of flight to a randomized flight-by-flight loading sequence.

The method is based on the assumption that the exceedance function for stress at a control point of the aircraft has been stepped (i.e. defined in terms of the number of occurrences at a finite number of stresses). One approach for obtaining the stepped exceedance function is described in reference (1). These data are derived for take-off taxi, flight (including all of the mission interval divisions such as ascent, cruise, combat, loiter, and descent), landing impact, touch-and-go landings, and landing taxi and arranged for input to the computer routine. In addition temperature exceedance functions may be placed in the program to provide a temperature corresponding to each stress occurrence.

It is assumed that the stresses and temperatures are randomized within each phase of flight. The ordering of missions flown within a lifetime may be predetermined or determined randomly. In addition, some freedom is allowed in selecting the flight time in a mission randomly. This feature is useful in the case where the exceedance data are derived from flight recorder data.

In all flight phases, the random sampling is done without replacement. As a consequence, the exceedance function derived from the flight-by-flight load sequence is identical with the input exceedance function.

The computer program along with a sample problem is included. This program terminates at the point of writing the flight-by-flight sequence of loads. To be of practical value, the output of this routine will have to put on cards or tape (whatever is required by the specific requirements of the test set-up).

SECTION II

DESCRIPTION OF METHOD

Based on flight recorder data, or for a new design, the mission profiles, the stress spectrum for positive load factors and the stress spectrum for negative load factors can be computed. The method for doing this was developed in Reference 1. These results when combined with gust, landing, and taxi loads can be used to generate the fatigue test loading sequence.

There are two possibilities that will be considered for this sequence. These are

- Case 1. - Stress spectra derived from flight recorder data
For this case the basic assumptions are
 - a. Loading randomized within a specified weight interval and loadings per unit time fixed within an interval
 - b. Weight intervals treated as nonrandom within a given mission type
 - c. Mission type treated as random or nonrandom within aircraft life
 - d. Hours per flight are randomized
 - e. Temperature treated as random within a given weight interval
- Case 2. - Stress spectra derived from the mission profiles
The basic assumptions are
 - a. Loading randomized within a mission interval and loadings per unit time fixed within a interval
 - b. Mission intervals treated as nonrandom within a given mission type
 - c. Mission type treated as random or nonrandom within aircraft life
 - d. Hours per flight determined from the appropriate mission profile or randomized
 - e. Temperature treated as random within a given mission interval

For both of these cases the following assumptions will be made

- (a) The sampling of the stress spectra will be done without replacement
- (b) When treated as a random process the mission type will be sampled without replacement

The flight-by-flight fatigue test loading sequence for a specified mission is developed in the following order:

- (a) Aircraft in take-off configuration resting on the landing gear
- (b) Take-off taxi load cycles applied for the time appropriate to this phase. It is assumed that the first load is a maximum, then a minimum followed by a maximum etc. Further, it is assumed the last load is a minimum.
- (c) The flight load cycles are applied mission or weight (as appropriate) interval by interval for the entire flight. The first loading in flight is a maximum. This is followed by a minimum (either from the population of one g load or the population of less than one g loads). The maximum-minimum-maximum etc. sequence is continued throughout the segment. The last flight load in each segment is assumed to be a minimum. As an option, the time spent in a given flight may be selected randomly. A selection may be made for each mission interval (or weight interval) in a mission.
- (d) The landing impact follows the last minimum flight load. This is a one time loading that is derived from a distribution of sink speeds, attitude, etc.
- (e) The final part of the loading sequence is the landing taxi. This is a cyclic loading with the first load a maximum followed by a minimum and then another maximum etc. It is assumed that the last load is a minimum. The time spent in landing taxi is that which is appropriate to the mission specified.

For each flight load occurrence in a mission or weight interval there will be an associated temperature derived from the velocity and altitude variations within that segment. It will be assumed that the population of temperatures is independent of the population of loads. Consequently, the sampling of the temperature population does not depend on the loading that has been selected for that time in the mission.

The following definitions describe the functions required to implement this process.

Suppose each of a , b , N_p , and N_m a positive integer such that a is in $[1, N_p]$ and b is in $[1, N_m]$. Further, suppose that σ_{TT}^{ab} is the stress at the a th control point for the aircraft resting on its landing gear ready to fly the b th mission.

Suppose that M_{TTp}^{ab} is a positive integer and σ_{TTp}^{ab} is a simple graph such that the x -projection of σ_{TTp}^{ab} is the set of integers in $[1, M_{TTp}^{ab}]$ and if i and $i+1$ are in $[1, M_{TTp}^{ab}]$ then $\sigma_{TTp}^{ab}(i)$ is less than $\sigma_{TTp}^{ab}(i+1)$. σ_{TTp}^{ab} is a finite number sequence with x -projection $[1, M_{TTp}^{ab}]$. Now suppose that i is a positive integer in $[1, M_{TTp}^{ab}]$ and n_{TTp}^{abl} is a simple graph such that the point $(\sigma_{TTp}^{ab}(i), n_{TTp}^{abl}(\sigma_{TTp}^{ab}(i)))$ belongs to n_{TTp}^{abl} only if $n_{TTp}^{abl}(\sigma_{TTp}^{ab}(i))$ is the number of take-off taxi load maximums during one lifetime at the stress $\sigma_{TTp}^{ab}(i)$ for the a th control point of the aircraft flying the b th mission. The total number of these take-off taxi load maximums is

$$n_{TTp_T}^{abl} = \sum_{i=1}^{M_{TTp}^{ab}} n_{TTp}^{abl}(\sigma_{TTp}^{ab}(i))$$

Therefore there are $n_{TTp_T}^{abl}$ selection candidates to obtain the

the first one of the M_{TTp}^{ab} stresses. A selection is made from the population of integers in $[1, n_{TTp_T}^{abl}]$ on the basis that if i and j

are integers in $[1, n_{TT}^{ab}]$ then the probability of choosing i is

equal to the probability of choosing j . Now, suppose that n_{TTp}^{ab} is

a simple graph with x-projection zero plus the set of integers in $[1, M_{TTp}^{ab}]$. Also, $n_{TTp}^{ab}(0) = 0$ and if i is in $[1, M_{TTp}^{ab}]$ then

$$n_{TTp}^{ab}(i) = \sum_{k=1}^i n_{TTp}^{ab}(\sigma_{TTp}^{ab}(k)).$$

Therefore, if j is an integer chosen from the integers in $[1, n_{TTp}^{ab}]$

then there exists a number m such that $n_{TTp}^{ab}(m-1) < j \leq n_{TTp}^{ab}(m)$.

It is desired to sample the population of integers in $[1, n_{TTp}^{ab}]$

without replacement. Therefore, before the second selection of a maximum

stress is made the number of maximums at the stress $\sigma_{TTp}^{ab}(m)$ must be reduced by one. Based on this reduction, the simple graphs n_{TTp}^{ab}

and n_{TTp}^{ab1} are transformed into n_{TTp}^{ab2} and n_{TTp}^{ab2} . It follows then if

$$n_{TTp}^{ab2} = n_{TTp}^{ab1} - 1 \text{ and if } j \text{ is an integer chosen from the integers}$$

in $[1, n_{TTp}^{ab2}]$ then there exists a number m such that $n_{TTp}^{ab2}(m-1) < j \leq n_{TTp}^{ab2}(m)$.

This process can be repeated until all of the maximums have been selected.

Suppose that M_{TTn}^{ab} is a positive integer and σ_{TTn}^{ab} is a finite number

sequence with x-projection $[1, M_{TTn}^{ab}]$. Now suppose that i is a positive

integer in $[1, M_{TTn}^{ab}]$ and n_{TTn}^{ab1} is a simple graph such that the point

$(\sigma_{TTn}^{ab}(i), n_{TTn}^{abl}(\sigma_{TTn}^{ab}(i)))$ belongs to n_{TTn}^{abl} only if $n_{TTn}^{abl}(\sigma_{TTn}^{ab}(i))$ is the number of take-off taxi load minimums during one lifetime at the stress $\sigma_{TTn}^{ab}(i)$ for the ath control point of the aircraft flying the bth mission. The total number of these take-off taxi load minimums is

$$n_{TTn_T}^{abl} = \sum_{i=1}^{M_{TTn}^{ab}} n_{TTn}^{abl}(\sigma_{TTn}^{ab}(i)) = n_{TTp_T}^{abl}$$

In this case there are the same number of selection candidates as for the take-off taxi load maximums. The selection from the minimums is made on the same basis as from the maximums. Suppose that n_{TTn}^{abl} is a simple graph with x-projection zero plus the set of integers in $[1, M_{TTn}^{ab}]$. Further, suppose that $n_{TTn}^{abl}(0) = 0$ and if i is in $[1, M_{TTn}^{ab}]$ then

$$n_{TTn}^{abl}(i) = \sum_{k=1}^i n_{TTn}^{abl}(\sigma_{TTn}^{ab}(k))$$

Therefore, if j is an integer chosen from the integers in $[1, n_{TTn_T}^{abl}]$ then there exists a number m such that $n_{TTn}^{abl}(m-1) < j \leq n_{TTn}^{abl}(m)$

As in the case of the maximums it is desired to sample the minimums without replacement. Consequently, the simple graphs n_{TTn}^{abl} and n_{TTn}^{abl} are transformed to n_{TTn}^{ab2} and n_{TTn}^{ab2} , etc.

Suppose that each of c and N_S^b is a positive integer such that c is in $[1, N_S^b]$. Further, suppose that M_{Fp}^{abc} is a positive integer and σ_{Fp}^{abc} is a finite number sequence with x-projection $[1, M_{Fp}^{abc}]$. Now, suppose that i is a positive integer in $[1, M_{Fp}^{abc}]$ and n_{Fp}^{abc1} is a

simple graph such that the point $(\sigma_{F_p}^{abc}, n_{F_p}^{abc1}(\sigma_{F_p}^{abc}))$ belongs to $n_{F_p}^{abc1}$ only if $n_{F_p}^{abc1}(\sigma_{F_p}^{abc})$ is the number of flight "positive g loads" during one lifetime at the stress $\sigma_{F_p}^{abc}$ for the ath control point of the airplane flying the cth interval of the bth mission. The term "positive g loads" refers to those maximum load occurrences corresponding to n_z in excess of one.

The total number of these positive g loads is

$$n_{F_{pT}}^{abc1} = \sum_{i=1}^{M_{F_p}^{abc}} n_{F_p}^{abc1}(\sigma_{F_p}^{abc}(i))$$

For the first load selection after take-off there are $n_{F_p}^{ab11}$ selection candidates to obtain one of $M_{F_p}^{ab1}$ stresses. A selection is made from the population of integers in $[1, n_{F_{pT}}^{ab11}]$ on an equal probability basis (as for the taxi). Now, suppose that $n_{F_p}^{abc1}$ is a simple graph with x-projection zero plus the set of integers in $[1, M_{F_p}^{abc}]$. Also, $n_{F_p}^{abc1}(0) = 0$ and if i is in $[1, M_{F_p}^{abc}]$ then

$$n_{F_p}^{abc1}(i) = \sum_{k=1}^i n_{F_p}^{abc1}(\sigma_{F_p}^{abc}(k)).$$

Thus, if j is an integer chosen from the integers in $[1, n_{F_{pT}}^{ab11}]$

then there exists a number m such that $n_{F_p}^{ab11}(m-1) < j \leq n_{F_p}^{ab11}(m)$.

This population is also sampled segment by segment without replacement until all of the maximums are selected.

Suppose that $M_{F_n}^{abc}$ is a positive integer and $\sigma_{F_n}^{abc}$ is a finite number sequence with x-projection $[1, M_{F_n}^{abc}]$. Further, suppose that i is a positive integer in $[1, M_{F_n}^{abc}]$ and $n_{F_n}^{abc1}$ is a simple graph such that the point $(\sigma_{F_n}^{abc}(i), n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i)))$ belongs to $n_{F_n}^{abc1}$ only if $n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i))$ is the number of "negative g loads" during one lifetime at the stress $\sigma_{F_n}^{abc}(i)$ for the ath control point of the airplane flying the cth interval of the bth mission. The term "negative g loads" refers to those minimum load occurrences corresponding to n_z less than one.

The total number of these negative g loads is

$$n_{F_n}^{abc1} = \sum_{i=1}^{M_{F_n}^{abc}} n_{F_n}^{abc1}(\sigma_{F_n}^{abc}(i))$$

It is assumed that each positive g loading is followed by either a negative g load or by a "one g load" (a "one g load" is a load corresponding to an n_z minimum equal to one).

The total number of one g loads for the ath control point of the aircraft flying the cth interval of the bth mission is

$$n_{F_n}^{abc1} = n_{F_n}^{abc1} - n_{F_n}^{abc1}$$

The stress spectrum for the one g loads will be derived from the velocity, altitude, and weight interval load occurrences that were used for the positive g load stress spectrum. It is assumed that for each load occurrence the normal load factor will be equal to one. To obtain the correct number of minimums from this spectrum, the number of loadings at each stress level will have to be multiplied by the ratio $\frac{n_{FgT}^{abc}}{n_{FgP}^{abc}}$. The resultant one g maneuver load

spectrum can be defined as follows:

Suppose M_{Fg}^{abc} is a positive integer and σ_{Fg}^{abc} is a finite number sequence with x-projection the interval $[1, M_{Fg}^{abc}]$. Also, suppose that i is an integer in $[1, M_{Fg}^{abc}]$ and n_{Fg}^{abc} is a simple graph such that the point $(\sigma_{Fg}^{abc}(i), n_{Fg}^{abc}(\sigma_{Fg}^{abc}(i)))$ belongs to n_{Fg}^{abc} only if $n_{Fg}^{abc}(\sigma_{Fg}^{abc}(i))$ is the number of "one g loads" during one lifetime at the stress $\sigma_{Fg}^{abc}(i)$ for the ath control point of the airplane flying the cth interval of the bth mission. Note that

$$n_{FgT}^{abc} = \sum_{i=1}^{M_{Fg}^{abc}} n_{Fg}^{abc}(\sigma_{Fg}^{abc}(i))$$

The selection of the flight load minimum is complicated by the fact that it may come from one of the negative g loads or it may come from one of the one g loads. This condition may be handled as follows: Suppose n_{Fn}^{abc} is a simple graph with x-projection zero plus the set

of integers in $[1, M_{Fg}^{abc} + M_{Fn}^{abc}]$. If i is in $[1, M_{Fg}^{abc}]$ then

$$n_{Fn}^{abc}(i) \text{ is } \sum_{k=1}^i n_{Fn}^{abc}(\sigma_{Fn}^{abc}(k)). \text{ If } i \text{ is in}$$

$[M_{Fg}^{abc} + 1, M_{Fg}^{abc} + M_{Fn}^{abc}]$ then $n_{Fn}^{abc}(i)$ is

$$n_{FgT}^{abc} + \sum_{k=1}^{i - M_{Fg}^{abc}} n_{Fn}^{abc}(\sigma_{Fn}^{abc}(k)). \text{ Also, } n_{Fn}^{abc}(0) = 0. \text{ Therefore,}$$

for the first flight load minimum selection, if j is an integer chosen from the integers in $[1, n_{FpT}^{ab1}]$ then there exists a number

m such that $n_{Fn}^{ab1}(m-1) < j \leq n_{Fn}^{ab1}(m)$. Again, the sampling is made without replacement so that the number of minimums is reduced by one. The transformations of n_{Fg}^{ab1} , n_{Fn}^{ab1} , and n_{Fn}^{ab12} to n_{Fg}^{ab12} , n_{Fn}^{ab12} , and n_{Fn}^{ab12} follows from this requirement. This population is sampled segment by segment until all of the minimums are drawn.

The landing impact stress spectrum will be sampled once per flight without replacement. This spectrum can be defined as follows:

Suppose $M_{L_i}^{ab}$ is a positive number and $\sigma_{L_i}^{ab}$ is a finite number sequence

with x-projection $[1, M_{L_i}^{ab}]$. Further, suppose j is a positive integer in $[1, M_{L_i}^{ab}]$ and $n_{L_i}^{ab1}$ is a simple graph such that the point $(\sigma_{L_i}^{ab}(j),$

$n_{L_i}^{ab1}(\sigma_{L_i}^{ab}(j)))$ belongs to $n_{L_i}^{ab1}$ only if $n_{L_i}^{ab1}(\sigma_{L_i}^{ab}(j))$ is the number of landing impact minimums during one lifetime at the stress

$\sigma_{L_i}(j)$ for the a th control point of the airplane flying the b th mission.

Suppose that $M_{LT_p}^{ab}$ is a positive integer and $\sigma_{LT_p}^{ab}$ is a finite number sequence with x-projection $[1, M_{LT_p}^{ab}]$. Further, suppose that

i is a positive integer in $[1, M_{LT_p}^{ab}]$ and $n_{LT_p}^{ab1}$ is a simple graph such that the point $(\sigma_{LT_p}^{ab}(i), n_{LT_p}^{ab1}(\sigma_{LT_p}^{ab}(i)))$ belongs to $n_{LT_p}^{ab1}$ only if

$n_{LT_p}^{ab1}(\sigma_{LT_p}^{ab}(i))$ is the number of landing taxi load maximums during

one lifetime at the stress $\sigma_{LT_p}^{ab}(i)$ for the a th control point of the

aircraft flying the bth mission. The total number of these maximums is

$$n_{LT_{p_T}}^{abl} = \sum_{i=1}^{M_{LT_p}^{ab}} n_{LT_p}^{abl} (\sigma_{LT_p}^{ab}(i)).$$

The landing taxi stress selection is analogous to that selection used for the take-off stresses. In this case there are $n_{LT_{p_T}}^{abl}$ selection candidates to obtain the first one of the

$M_{LT_p}^{ab}$ stresses. This selection is made on an equal probability basis. Now suppose that $n_{LT_p}^{abl}$ is a simple graph with x-projection zero plus the set of integers in $[1, M_{LT_p}^{ab}]$. Also, $n_{LT_p}^{abl}(0) = 0$ and if i is in $[1, M_{LT_p}^{ab}]$ then

$$n_{LT_p}^{abl}(i) = \sum_{k=1}^i n_{LT_p}^{abl} (\sigma_{LT_p}^{ab}(k))$$

The simple graph $n_{LT_p}^{abl}$ is used to determine the stress that corresponds to the selection from the $n_{LT_{p_T}}^{abl}$ integers.

Again, the sampling is done without replacement until the entire population has been selected.

Suppose $M_{LT_n}^{ab}$ is a positive integer and $\sigma_{LT_n}^{ab}$ is a finite number sequence with x-projection $[1, M_{LT_n}^{ab}]$. Further, suppose that i is a positive integer in $[1, M_{LT_n}^{ab}]$ and $n_{LT_n}^{abl}$ is a simple graph such that the point $(\sigma_{LT_n}^{ab}(i), n_{LT_n}^{abl}(\sigma_{LT_n}^{ab}(i)))$ belongs to $n_{LT_n}^{abl}$ only if $n_{LT_n}^{abl}(\sigma_{LT_n}^{ab}(i))$ is the number of landing taxi load

minimums during one lifetime at the stress $\sigma_{LT_n}^{ab}(i)$ for the ath control point of the aircraft flying the bth mission. The total number of these maximums is

$$n_{LT_n}^{abl} = \sum_{i=1}^{M_{LT_n}^{ab}} n_{LT_n}^{abl}(\sigma_{LT_n}^{ab}(i))$$

The minimum stress selection is made on the same basis as the maximum stress selection. For this purpose suppose that $n_{LT_n}^{abl}$ is a simple graph with x-projection zero plus the set of integers in $[1, M_{LT_n}^{ab}]$. Also, $n_{LT_n}^{abl}(0) = 0$ and if i is in $[1, M_{LT_n}^{ab}]$ then

$$n_{LT_n}^{abl}(i) = \sum_{k=1}^i n_{LT_n}^{abl}(\sigma_{LT_n}^{ab}(k))$$

The sampling for the minimum stresses is done without replacement until all of the candidates have been selected.

To include the temperature effects on the test, the following functions need to be defined. Suppose that M_F^{abc} is a positive integer and T_F^{abc} is a finite number sequence with x-projection $[1, M_F^{abc}]$. Further, suppose that i is a positive integer in $[1, M_F^{abc}]$ and n_F^{abc} is a simple graph such that the point $(T_F^{abc}(i), n_F^{abc}(T_F^{abc}(i)))$ belongs to n_F^{abc} only if $n_F^{abc}(T_F^{abc}(i))$ is the number of occurrences during one lifetime of the temperature $T_F^{abc}(i)$ at the ath control point of the airplane flying the cth interval of the bth mission.

The total number of these temperature occurrences must agree with the number of load occurrences. That is,

$$n_{F_T}^{abc1} = \sum_{i=1}^{M_F^{abc}} n_F^{abc1}(T_F^{abc}(i)) = 2n_F^{abc1} p_T$$

The temperature sampling is made without replacement first from the set of integers in $[1, n_{F_T}^{ab1}]$. For this purpose suppose n_F^{abc1} is a simple graph with x-projection zero plus the set of integers in $[1, M_F^{abc}]$. Also, $n_F^{abc1}(0) = 0$ and if i is in $[1, M_F^{abc}]$ then

$$n_F^{abc1}(i) = \sum_{k=1}^i n_F^{abc1}(T_F^{abc}(k))$$

Therefore, if j is an integer chosen from the integers in $[1, n_{F_T}^{ab1}]$ then there exists a number m such that

$$n_F^{ab1}(m-1) < j \leq n_F^{ab1}(m)$$

This population is sampled segment by segment until all temperatures have been selected.

The special case of the touch-and-go landing must be considered. For this case it is assumed that there are two loads. First, there is a landing impact load followed by a "one g" load. The first touch-and-go in a given mission is assumed to be preceded by a flight load minimum. If there are repeated touch-and-go landings it is assumed that there are no flight loads between them.

The required functions for this case are defined as follows: Suppose $M_{TG_i}^{ab}$ is a positive integer and $\sigma_{TG_i}^{ab}$ is a finite number sequence with x-projection $[1, M_{TG_i}^{ab}]$. Further suppose that j is a positive integer in $[1, M_{TG_i}^{ab}]$ and $n_{TG_i}^{ab1}$ is a simple graph such that the point $(\sigma_{TG_i}^{ab}(j), n_{TG_i}^{ab1}(\sigma_{TG_i}^{ab}(j)))$ belongs to $n_{TG_i}^{ab1}$ only if $n_{TG_i}^{ab1}(\sigma_{TG_i}^{ab}(j))$ is the number of touch-and-go landing impact loads during one lifetime at the stress $\sigma_{TG_i}^{ab}(j)$ for the ath control point of the

aircraft flying the bth mission. The total number of these landing impact loads is

$$n_{TG_i}^{abl} = \sum_{j=1}^{M_{TG_i}^{ab}} n_{TG_i}^{abl}(\sigma_{TG_i}^{ab}(j))$$

Now, suppose that $n_{TG_i}^{abl}$ is a simple graph such that the x-projection of $n_{TG_i}^{abl}$ is zero plus the integers in $[1, M_{TG_i}^{ab}]$. Also, $n_{TG_i}^{abl}(0) = 0$ and if j is in $[1, M_{TG_i}^{ab}]$ then

$$n_{TG_i}^{abl}(j) = \sum_{k=1}^j n_{TG_i}^{abl}(\sigma_{TG_i}^{ab}(k))$$

The sampling of the population of integers in $[1, n_{TG_i}^{abl}]$ is made without replacement as in the case of the previously defined normal landing impact.

For the following one g load suppose that $M_{TG_g}^{ab}$ is a positive integer and $\sigma_{TG_g}^{ab}$ is a finite number sequence with x-projection

$[1, M_{TG_g}^{ab}]$. Further, suppose that i is a positive integer in $[1, M_{TG_g}^{ab}]$

and $n_{TG_g}^{abl}$ is a simple graph such that the point $(\sigma_{TG_g}^{ab}(i), n_{TG_g}^{abl}(\sigma_{TG_g}^{ab}(i)))$

belongs to $n_{TG_g}^{abl}$ only if $n_{TG_g}^{abl}(\sigma_{TG_g}^{ab}(i))$ is the number of one g load conditions (after a touch-and-go landing) during one lifetime at the stress $\sigma_{TG_g}^{ab}(i)$ for the ath control point of the aircraft flying the bth mission.

The total number of these loads must be the same as the touch-and-go impact loads. Therefore

$$n_{TG_g}^{abl} = \sum_{i=1}^{M_{TG_g}^{ab}} n_{TG_g}^{abl}(\sigma_{TG_g}^{ab}(i)) = n_{TG_i}^{abl}$$

To facilitate the sampling process suppose that $n_{TG_g}^{abl}$ is a simple graph such that the x-projection of $n_{TG_g}^{abl}$ is zero plus the set of integers in $[1, M_{TG_g}^{ab}]$. Further $n_{TG_g}^{abl}(o) = 0$ and if i is in $[1, M_{TG_g}^{ab}]$ then

$$n_{TG_g}^{abl}(i) = \sum_{k=1}^i n_{TG_g}^{abl}(\sigma_{TG_g}^{ab}(k))$$

The sampling of the population of integers in $[1, n_{TG_g}^{abl}]$ is made without replacement.

SECTION III
DESCRIPTION OF COMPUTER PROGRAM

1 NOTATION

NCASE = 1 if flight maneuver stress spectra is derived from recorded data
= 2 if flight maneuver stress spectra is derived from mission profiles

NM - Number of missions

NRANM = 1 if missions are randomly selected
= 2 if mission selection is nonrandom

NMTMS = 1 if the number of maximum flight load occurrences per mission is nonrandom. If NMTMS > 1 then NMTMS is the number of possible candidates for random selection of the number of maximum flight load occurrences per mission

NFLT - Number of flights in one lifetime

NHRS - Number of flight hours in one lifetime

MISRPT - Number of times a mission sequence occurs in a lifetime (for nonrandom mission selection)

MNUMS - Number of different mission selections in a sequence (for nonrandom mission selection)

NS(i) - Number of mission intervals in the ith mission (excluding take-off and landing)

NTG(i) - Number of touch-and-go landings in the ith mission

NTEMP(i) = 1 if a temperature profile is not included in the ith mission
= 2 if a temperature profile is included in the ith mission

NTTF(i) - Number of maximum take-off taxi load occurrences per flight for the ith mission

NFF(k,i,j) - Number of maximum flight load occurrences per flight for the kth selection from NMTMS possible candidates for the jth interval of the ith mission

NLTF(i) - Number of maximum landing taxi load occurrences per flight for the ith mission

MNUM(i) - The *i*th mission number selected (nonrandomly) in a mission sequence that occurs MISRPT times in a lifetime
NUMRPT(i) - The number of entries of MNUM(i) within a mission sequence
NFRAC(k, i, j) - Number of times per lifetime that the *k*th selection from NMTMS possible candidates for the *j*th interval of the *i*th mission that the number NFF(k, i, j) is selected
NUMML(i) - Number of times the *i*th mission occurs in one lifetime
MTTP(i) - Number of maximum take-off taxi load intervals for the *i*th mission
MTTN(i) - Number of minimum take-off taxi load intervals for the *i*th mission
MFP(i, j) - Number of positive *g* load intervals for the *j*th interval of the *i*th mission
MFN(i, j) - Number of negative *g* load intervals for the *j*th interval of the *i*th mission
MFG(i, j) - Number of one *g* load intervals for the *j*th interval of the *i*th mission
MLI(i) - Number of landing impact load intervals for the *i*th mission
MLTP(i) - Number of maximum landing taxi load intervals for the *i*th mission
MLTN(i) - Number of minimum landing taxi load intervals for the *i*th mission
MF(i, j) - Number of temperature intervals for the *j*th interval of the *i*th mission
MTGI(i) - Number of touch-and-go landing impact load intervals for the *i*th mission
MTGG(i) - Number of touch-and-go landing one *g* load intervals for the *i*th mission
MTTP(i, j) - Number of maximum take-off taxi load occurrences in the *j*th load interval for the *i*th mission
NTTN(i, j) - Number of minimum take-off taxi load occurrences in the *j*th load interval for the *i*th mission
NFP(i, j, k) - Number of positive *g* load occurrences in the *k*th load interval for the *j*th interval of the *i*th mission

$NFN(i, j, k)$ - Number of negative g load occurrences in the kth load interval for the jth interval of the ith mission
 $NFG(i, j, k)$ - Number of one g load occurrences in the kth load interval for the jth interval of the ith mission
 $NLI(i, j)$ - Number of landing impact load occurrences in the jth load interval for the ith mission
 $NLTP(i, j)$ - Number of maximum landing taxi load occurrences in the jth load interval for the ith mission
 $NLTN(i, j)$ - Number of minimum landing taxi load occurrences in the jth load interval for the ith mission
 $NF(i, j, k)$ - Number of temperature occurrences in the kth temperature interval for the jth interval of the ith mission
 $NTGI(i, j)$ - Number of touch-and-go landing impact load occurrences per lifetime in the jth load interval for the ith mission
 $NTGG(i, j)$ - Number of touch-and-go landing one g load occurrences per lifetime in the jth load interval for the ith mission
 TL - Temperature for all ground load conditions
 $SR(i)$ - Stress for the take-off configuration for the ith mission (aircraft resting on the landing gear)
 $STTP(i, j)$ - Stress in the jth maximum take-off taxi load interval for the ith mission
 $STTN(i, j)$ - Stress in the jth minimum take-off taxi load interval for the ith mission
 $SFP(i, j, k)$ - Stress in the kth positive g flight load interval for the jth interval of the ith mission
 $SFN(i, j, k)$ - Stress in the kth negative g flight load interval for the jth interval of the ith mission
 $SFG(i, j, k)$ - Stress in the kth one g flight load interval for the jth interval of the ith mission
 $SLI(i, j)$ - Stress in the jth landing impact load interval for the ith mission
 $SLTP(i, j)$ - Stress in the jth maximum landing taxi load interval for the ith mission
 $SLTN(i, j)$ - Stress in the jth minimum landing taxi load interval for the ith mission

TF(i, j, k) - Temperature in the kth flight temperature interval for the jth interval of the ith mission

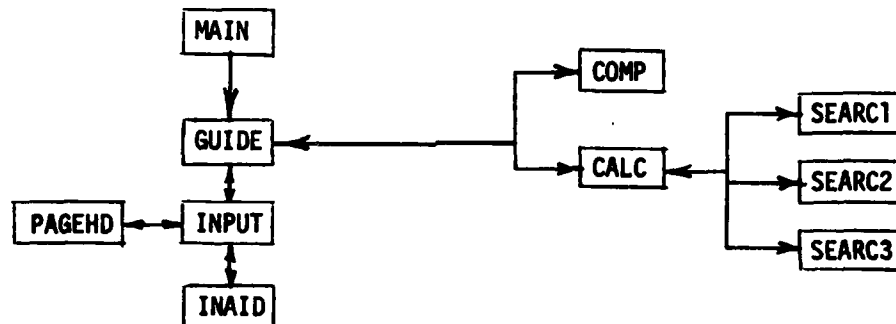
STGI(i, j) - Stress in the jth touch-and-go landing impact load interval for the ith mission

STGG(i, j) - Stress in the jth touch-and-go one g load interval for the ith mission

2 COMPUTER FLOW DIAGRAM AND PROGRAMS

The computer routine was coded in FORTRAN Extended Language with the main program and subroutines arranged as follows:

SPECF Program (See Appendix A)



MAIN - Main Program - Sets NZERO to zero and transfers control to GUIDE

GUIDE - Subroutine - Initially zeros input and output numbers and after first case zeros output numbers before the calculations are performed GUIDE is the subroutine for transferring control to INPUT, COMP, and CALC in turn.

INPUT - Subroutine - Reads in all input data. The details of the data input are discussed later in this section

INAIID - Subroutine - Called by INPUT to write certain input data. INAIID sets NZERO = 1 for control in GUIDE

PAGEHD - Subroutine - Writes out page heading including run identification, date, and page number

COMP - Subroutine - Checks the input data for compatibility as follows:

$$\text{For } i \text{ in } [1, NM]$$

$$\text{NTTF}(i) \cdot \text{NUMML}(i) = \sum_{j=1}^{\text{MTTP}(i)} \text{NTTP}(i, j)$$

$$NTTF(i) \cdot NUMML(i) = \sum_{j=1}^{MTTN(i)} NTFN(i, j)$$

$$NUMML(i) = \sum_{j=1}^{MLI(i)} NLI(i, j)$$

$$NLTF(i) \cdot NUMML(i) = \sum_{j=1}^{MLTP(i)} NLTP(i, j)$$

$$NLTF(i) \cdot NUMML(i) = \sum_{j=1}^{MLI(i)}$$

$$NTG(i) \cdot NUMML(i) = \sum_{j=1}^{MTGI(i)} NTGI(i, j)$$

$$NTG(i) \cdot NUMML(i) = \sum_{j=1}^{MTGG(i)} NTGG(i, j)$$

$$NFLT = \sum_{i=1}^{NM} NUMML(i)$$

For j in [1, NS(i)]

$$\sum_{k=1}^{NMTMS} NFF(i, j, k) \cdot NFRAC(i, j, k) = \sum_{k=1}^{MFP(i, j)} NFP(i, j, k)$$

$$\sum_{k=1}^{NMTMS} NFF(i, j, k) \cdot NFRAC(i, j, k) = \sum_{k=1}^{MFN(i, j)} NFN(i, j, k) + \sum_{k=1}^{MFG(i, j)} NFG(i, j, k)$$

If any of the above conditions are violated, an error signal will be printed and GUIDE will be called.

CALC - Subroutine - Computes and prints flight-by-flight load sequence

SEARC1 - Subroutine - Makes random selection of stress where the number of occurrences per lifetime is a one dimensional array

SEARC2 - Subroutine - Makes random selection of stress where the number of occurrences per lifetime is a two dimensional array

SEARC3 - Subroutine - Makes random selection of stress of temperature where the number of occurrences per lifetime is a three dimensional array

3 EQUIVALENCE TABLES

All input numbers for this routine are placed in blank common. All input floating point numbers are called parameters and are contained in P (dimensioned 13,000). All input fixed point numbers are called integers and are contained in N (dimensioned 13,500). To make the program usable, EQUIVALENCE statements are used to give the P and N numbers more recognizable names. The SPECIF program parameter and integer tables are given below.

EQUIVALENCE TABLE - P (Parameters)

P	Dim	Term	P	Dim	Term
1	(1)	TL	101	(12)	SR(1)
			111		SR(12)
			115	(12,20)	STTP(1,1)
			354		STTP(12,20)
			415	(12,20)	STTN(1,1)
			654		STTN(12,20)
			715	(12,10,20)	SFP(1,1,1)
			3114		SFP(12,10,20)
			3115	(12,10,20)	SFN(1,1,1)
			5514		SFN(12,10,20)
			5515	(12,10,20)	SFG(1,1,1)
			7914		SFG(12,10,20)
			7915	(12,20)	SLI(1,1)
			8154		SLI(12,20)
			8215	(12,20)	SLTP(1,1)
			8454		SLTP(12,20)
			8515	(12,20)	SLTN(1,1)
			8754		SLTN(12,20)
			8815	(12,10,20)	TF(1,1,1)
			11214		TF(12,10,20)
			11215	(12,20)	STGI(1,1)
			11454		STGI(12,20)
			11515	(12,20)	STGG(1,1)
			11754		STGG(12,20)
			11815	(300)	STRESS(1)
			12114		STRESS(300)
			12115	(300)	TEMP(1)
			12414		TEMP(300)

EQUIVALENCE TABLE - N (Integer)

N	Dim	Term	N	Dim	Term
1	(1)	IDENT			
2	(1)	NPF1			
3	(1)	NPF2	115	(12, 20)	NTTP(1, 1)
4	(1)	NPF3	354		NTTP(12, 20)
5	(1)	NPF4	415	(12, 20)	NTTN(1, 1)
6	(1)	NPF5	654		NTTN(12, 20)
7	(1)	NPF6	715	(12, 10, 20)	NFP(1, 1, 1)
8	(1)	MONTH	3114		NFP(12, 10, 20)
9	(1)	DAY	3115	(12, 10, 20)	NFN(1, 1, 1)
10	(1)	YEAR	5514		NFN(12, 10, 20)
11	(1)	NCASE	5515	(12, 10, 20)	NFG(1, 1, 1)
12	(1)	NM	7914		NFG(12, 10, 20)
13	(1)	NRANM	7915	(12, 20)	NLI(1, 1)
14	(1)	NMORE	8154		NLI(12, 20)
15	(1)	NMTMS	8215	(12, 20)	NLTP(1, 1)
16	(1)	NFLT	8454		NLTP(12, 20)
17	(1)	NHRS	8515	(12, 20)	NLTN(1, 1)
18	(1)	MISRPT	8754		NLTN(12, 20)
19	(1)	MNUMS	8815	(12, 10, 20)	NF(1, 1, 1)
20	(1)		11214		NF(12, 10, 20)
			11215	(12, 20)	NTGI(1, 1)
			11454		NTGI(12, 20)
			11515	(12, 20)	NTGG(1, 1)
			11754		NTGG(12, 20)
			11815	(12)	MTTP(1)
			11826		MTTP(12)
			11830	(12)	MTTN(1)
			11841		MTTN(12)
			11845	(12, 10)	MFP(1, 1)
			11964		MFP(12, 10)
			11965	(12, 10)	MFN(1, 1)
			12084		MFN(12, 10)
			12085	(12, 10)	MFG(1, 1)
			12204		MFG(12, 10)
			12205	(12)	MLI(1)
48	(1)	NZERO	12216		MLI(12)
49	(1)	NPAGE	12220	(12)	MLTP(1)
			12231		MLTP(12)

EQUIVALENCE TABLE - N - (Integer)

N	Dim	Term
12235	(12)	MLTN(1)
12246		MLTN(12)
12250	(12, 20)	MF(1, 1)
12369		MF(12, 10)
12370	(12)	MTGI(1)
12381		MTGI(12)
12385	(12)	MTGG(1)
12396		MTGG(12)
12400	(12)	NS(1)
12411		NS(12)
12415	(12)	NTG(1)
12426		NTG(12)
12430	(12)	NTEMP(1)
12441		NTEMP(12)
12445	(12)	NTTF(1)
12456		NTTF(12)
12460	(3, 12, 10)	NFF(1, 1, 1)
12819		NFF(3, 12, 10)
12820	(12)	NLTF(1)
12831		NLTF(12)
12835	(50)	MNUM(1)
12884		MNUM(50)
12885	(50)	NUMRPT(1)
12934		NUMRPT(50)
12935	(3, 12, 10)	NFRAC(1, 1, 1)
13294		NFRAC(3, 12, 10)
13295	(12)	NUMML(1)
13306		NUMML(12)

4 INPUT DATA

All of the input data described below is read into the program by means of the subroutine INPUT. This program is a general purpose routine to read the P (parameters) and N integers. There are several options by which this may be done by this routine. A suggested deck arrangement is given as follows:

1415 Format

IDENT	1	1	NPF3	0	NPF5	NPF6	MONTH	DAY	YEAR	NCASE	NM	NRANM	0
-------	---	---	------	---	------	------	-------	-----	------	-------	----	-------	---

515 Format

NMTMS	NFLT	NHRS	MISRPT	MNUMS
-------	------	------	--------	-------

72H Format

Run Description

72H Format

Run Description

315 Format

101	100 + NM	1
-----	----------	---

6E10.3 Format

SR(1) - SR(NM)

I5 E15.7 Format

1	TL
---	----

315 Format

12400	12399 + NM	1
-------	------------	---

1215 Format

NS(1) - NS(NM)

(NS(1) must not exceed 10)

315 Format

12415	12414 + NM	1
-------	------------	---

1215 Format

NTG(1) - NTG(NM)

315 Format

12430	12429 + NM	1
-------	------------	---

1215 Format

NTEMP(1) - NTEMP(NM)

315 Format

12445	12444 + NM	1
-------	------------	---

1215 Format

NTTF(1) - NTTF(NM)

315 Format

12820	12819 + NM	1
-------	------------	---

1215 Format

NLTF(1) - NLTF(NM)

3I5 Format

13295	13294 + NM	1
-------	------------	---

12I5 Format

NUMML(1) - NUMML(NM)

If NRANM = 1 go to (bb), if NRANM = 2 go to (aa)

3I5 Format

(aa)

12835	12834 + MNUMS	1
-------	---------------	---

12I5 Format

MNUM(1) - MNUM(MNUMS)

3I5 Format

12885	12884 + MNUMS	1
-------	---------------	---

12I5 Format

NUMRPT(1) - NUMRPT(MNUMS)

(bb) 3I5 Format

11815	11814 + NM	1
-------	------------	---

12I5 Format

MTTP(1) - MTTP(NM)

(MTTP(1) must not exceed 20)

3I5 Format

11830	11829 + NM	1
-------	------------	---

12I5 Format

MTTN(1) - MTTN(NM)

(MTTN(1) must not exceed 20)

12205	12204 + NM	1
-------	------------	---

MLI(1) - MLI(NM)

3I5 Format

12220	12219 + NM	1
-------	------------	---

12I5 Format

MLTP(1) - MLTP(NM)

3I5 Format

12235	12234 + NM	1
-------	------------	---

12I5 Format

MLTN(1) - MLTN(NM)

If i is in $[1, NM]$ and $NTG(i) = 0$ go to (b), otherwise go to (a)

(a)

3I5 Format

12370	12369 + NM	1
-------	------------	---

12I5 Format

MTGI(1) - MTGI(NM)

(MTGI(i) must not exceed 20)

3I5 Format

12385	12384 + NM	1
-------	------------	---

12I5 Format

MTGG(1) - MTGG(NM)

(MTGG(i) must not exceed 20)

I5 Format

(b)

NM

7I5 Format

115	1	1	MTTP(1)	1	12	20
-----	---	---	---------	---	----	----

6E10.3 Format

STTP(1, 1) - STTP(1, MTTP(1))

⋮

7I5 Format

115	1	1	MTTP(i)	1	12	20
-----	---	---	---------	---	----	----

6E10.3 Format

STTP(1, 1) - STTP(1, MTTP(1))

⋮

7I5 Format

115	1	NM	MTTP(NM)	1	12	20
-----	---	----	----------	---	----	----

6E10.3 Format

STTP(NM, 1) - STTP(NM, MTTP(NM))

I5 Format

NM

7I5 Format

415	1	1	MTTN(1)	1	12	20
-----	---	---	---------	---	----	----

6E10.3 Format

STTN(1, 1) - STTN(1, MTTN(1))

⋮

7I5 Format

415	1	i	MTTN(i)	1	12	20
-----	---	---	---------	---	----	----

6E10.3 Format

STTN(i, 1) - STTN(i, MTTN(i))

⋮

7I5 Format

415	1	NM	MTTN(NM)	1	12	20
-----	---	----	----------	---	----	----

6E10.3 Format

STTN(NM, 1) - STTN(NM, MTTN(NM))

I5 Format

NM $\sum_{i=1}^{NS(i)}$

7I5 Format

715	1	1	MFP(1, 1)	12	10	20
-----	---	---	-----------	----	----	----

6E10.3 Format

SFP(1, 1, 1) - SFP(1, 1, MFP(1, 1))

⋮

7I5 Format

7I5	i	j	MFP(i,j)	12	10	20
-----	---	---	----------	----	----	----

6E10.3 Format

SFP(i, j, 1) - SFP(i, j, MFP(i, j))

⋮

7I5 Format

7I5	NM	NS(NM)	MFP(NM,NS(NM))	12	10	20
-----	----	--------	----------------	----	----	----

6E10.3 Format

SFP(NM, NS(NM), 1) - SFP(NM, NS(NM), MFP(NM, NS(NM)))

I5 Format

NM	
$\sum_{i=1}$	NS(i)

7I5 Format

3I15	1	1	MFN(1, 1)	12	10	20
------	---	---	-----------	----	----	----

6E10.3 Format

SFN(1, 1, 1) - SFN(1, 1, MFN(1, 1))

⋮

7I5 Format

3I15	1	j	MFN(1, j)	12	10	20
------	---	---	-----------	----	----	----

6E10.3 Format

$SFN(i, j, 1) - SFN(i, j, MFN(i, j))$

⋮

7I5 Format

3115	NM	NS(NM)	MFN(NM, NS(NM))	12	10	20
------	----	--------	-----------------	----	----	----

6E10.3 Format

$SFN(NM, NS(NM), 1) - SFN(NM, NS(NM), MFN(NM, NS(NM)))$

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

5515	1	1	MFG(1, 1)	12	10	20
------	---	---	-----------	----	----	----

6E10.3 Format

$SFG(1, 1, 1) - SFG(1, 1, MFG(1, 1))$

⋮

7I5 Format

5515	i	j	MFG(i, j)	12	10	20
------	---	---	-----------	----	----	----

6E10.3 Format

$SFG(i, j, 1) - SFG(i, j, MFG(i, j))$

⋮

7I5 Format

5515	NM	NS(NM)	MFG(NM, NS(NM))	12	10	20
------	----	--------	-----------------	----	----	----

6E10.3 Format

$SFG(NM, NS(NM), 1) - SFG(NM, NS(NM), MFG(NM, NS(NM)))$

I5 Format

$NM \sum_{i=1} NS(i) \cdot (NTEMP(i) - 1)$
--

If this card entry = 0, omit and go to (d), otherwise go to (c).

(c)

7I5 Format

8815	N1	NS(N1)	MF(N1, NS(N1))	12	10	20
------	----	--------	----------------	----	----	----

6E10.3 Format

$TF(N1, NS(N1), 1) - TF(N1, NS(N1), MF(N1, NS(N1)))$
--

⋮

7I5 Format

8815	i	j	MF(i, j)	12	10	20
------	---	---	----------	----	----	----

6E10.3 Format

TF(i, j, 1) - TF(i, j, MF(i, j))

⋮

715 Format

8815	N2	NS(N2)	MF(N2, NS(N2))	12	10	20
------	----	--------	----------------	----	----	----

6E10.3 Format

TF(N2, NS(N2), 1) - TF(N2, NS(N2), MF(N2, NS(N2)))
--

N1 is first mission with NTEMP(N1) = 2

N2 is last mission with NTEMP(N2) = 2

(d)

I5 Format

NM

715 Format

7915	1	1	MLI(1)	1	12	20
------	---	---	--------	---	----	----

6E10.3 Format

SLI(1, 1) - SLI(1, MLI(1))

⋮

715 Format

7915	1	1	MLI(1)	1	12	20
------	---	---	--------	---	----	----

6E10.3 Format

SLI(i, 1) - SLI(i, MLI(i))

⋮

715 Format

7915	1	NM	MLI(NM)	1	12	20
------	---	----	---------	---	----	----

6E10.3 Format

SLI(NM, 1) - SLI(NM, MLI(1))

I5 Format

NM

715 Format

8215	1	1	MLTP(1)	1	12	20
------	---	---	---------	---	----	----

6E10.3 Format

SLTP(1, 1) - SLTP(1, MLTP(1))

⋮

715 Format

8215	1	1	MLTP(1)	1	12	20
------	---	---	---------	---	----	----

6E10.3 Format

SLTP(i, 1) - SLTP(i, MLTP(i))

⋮

7I5 Format

8215	1	NM	MLTP(NM)	1	12	20
------	---	----	----------	---	----	----

6E10.3 Format

SLTP(NM, 1) - SLTP(NM, MLTP(NM))

I5 Format

NM

7I5 Format

8515	1	1	MLTN(1)	1	12	20
------	---	---	---------	---	----	----

6E10.3 Format

SLTN(1, 1) - SLTN(1, MLTN(1))

⋮

7I5 Format

8515	1	i	MLTN(i)	1	12	20
------	---	---	---------	---	----	----

6E10.3 Format

SLTN(i, 1) - SLTN(i, MLTN(i))

⋮

7I5 Format

8515	1	NM	MLTN(NM)	1	12	20
------	---	----	----------	---	----	----

6E10.3 Format

SLTN(NM, 1) - SLTN(NM, MTLN(NM))

I5 Format

N3

N3 is the number of missions that have a touch-and-go landing.
If N3 = 0 omit this card and go to (f), otherwise go to (e).

(e)

7I5 Format

11215	1	N4	MTGI(N4)	1	12	20
-------	---	----	----------	---	----	----

6E10.3 Format

STGI(N4, 1) - STGI(N4, MTGI(N4))

⋮

7I5 Format

11215	1	1	MTGI(1)	1	12	20
-------	---	---	---------	---	----	----

6E10.3 Format

STGI(1, 1) - STGI(1, MTGI(1))

⋮

7I5 Format

11215	1	N5	MTGI(N5)	1	12	20
-------	---	----	----------	---	----	----

6E10.3 Format

STGI(N5, 1) - STGI(N5, MTGI(N5))

N4 is first mission with NTG(N4) ≠ 0
N5 is last mission with NTG(N5) ≠ 0

I5 Format

N3

7I5 Format

11515	1	N4	MTGG(N4)	1	12	20
-------	---	----	----------	---	----	----

6E10.3 Format

STGG(N4, 1) - STGG(N4, MTGG(N4))

⋮

7I5 Format

11515	1	i	MTGG(i)	1	12	20
-------	---	---	---------	---	----	----

6E10.3 Format

STGG(1, 1) - STGG(1, MTGG(1))

⋮

7I5 Format

11515	1	N5	MTGG(N5)	1	12	20
-------	---	----	----------	---	----	----

6E10.3 Format

STGG(N5, 1) - STGG(N5, MTGG(N5))

(f) I5 Format

NM-NMTMS

7I5 Format

12460	1	1	NS(1)	3	12	10
-------	---	---	-------	---	----	----

12I5 Format

NFF(1, 1, 1) - NFF(1, 1, NS(1))

⋮

7I5 Format

12460	1	j	NS(j)	3	12	10
-------	---	---	-------	---	----	----

1215 Format

$NFF(i, j, 1) - NFF(i, j, NS(j))$

⋮

715 Format

12460	NMTMS	NM	NS(NM)	3	12	10
-------	-------	----	--------	---	----	----

1215 Format

$NFF(NMTMS, NM, 1) - NFF(NMTMS, NM, NS(NM))$
--

I5 Format

NM-NMTMS

715 Format

12935	1	1	NS(1)	3	12	10
-------	---	---	-------	---	----	----

1215 Format

$NFRAC(1, 1, 1) - NFRAC(1, 1, NS(1))$

⋮

715 Format

12935	i	j	NS(j)	3	12	10
-------	---	---	-------	---	----	----

1215 Format

$NFRAC(i, j, 1) - NFRAC(i, j, NS(j))$

⋮

715 Format

12935	NMTMS	NM	NS(NM)	3	12	10
-------	-------	----	--------	---	----	----

1215 Format

$NFRAC(NMTMS, NM, 1) - NFRAC(NMTMS, NM, NS(NM))$
--

15 Format

NM

715 Format

115	1	1	MTTP(1)	1	12	20
-----	---	---	---------	---	----	----

1215 Format

NTTP(1, 1) - NTTP(1, MTTP(1))

⋮

715 Format

115	1	i	MTTP(i)	1	12	20
-----	---	---	---------	---	----	----

1215 Format

NTTP(i, 1) - NTTP(i, MTTP(i))

⋮

715 Format

115	1	NM	MTTP(NM)	1	12	20
-----	---	----	----------	---	----	----

1215 Format

NTTP(NM, 1) - NTTP(NM, MTTP(NM))

15 Format

NM

715 Format

415	1	1	MTTN(1)	1	12	20
-----	---	---	---------	---	----	----

12I5 Format

$NTTN(1, 1) - NTTN(1, MTTN(1))$

⋮

415	1	1	$MTTN(i)$	1	12	20
-----	---	---	-----------	---	----	----

12I5 Format

$NTTN(i, 1) - NTTN(i, MTTN(i))$

⋮

415	1	NM	$MTTN(NM)$	1	12	20
-----	---	----	------------	---	----	----

12I5 Format

$NTTN(NM, 1) - NTTN(NM, MTTN(NM))$

I5 Format

$\sum_{i=1}^{NM} NS(i)$

7I5 Format

715	1	1	$MFP(1, 1)$	12	10	20
-----	---	---	-------------	----	----	----

12I5 Format

$NFP(1, 1, 1) - NFP(1, 1, MFP(1, 1))$

⋮

7I5 Format

715	1	J	$MFP(1, J)$	12	10	20
-----	---	---	-------------	----	----	----

1215 Format

$NFP(i, j, 1) - NFP(i, j, MFP(i, j))$

⋮

715 Format

715	NM	NS(NM)	MFP(NM, NS(NM))	12	10	20
-----	----	--------	-----------------	----	----	----

1215 Format

$NFP(NM, NS(NM), 1) - NFP(NM, NS(NM), MFP(NM, NS(NM)))$

15 Format

NM	
$\sum_{i=1}$	NS(i)

715 Format

3115	1	1	MFN(1, 1)	12	10	20
------	---	---	-----------	----	----	----

1215 Format

$NFN(1, 1, 1) - NFN(1, 1, MFN(1, 1))$

⋮

715 Format

3115	i	j	MFN(i, j)	12	10	20
------	---	---	-----------	----	----	----

1215 Format

$NFN(i, j, 1) - NFN(i, j, MFN(i, j))$

⋮

715 Format

3115	NM	NS(NM)	MFN(NM, NS(NM))	12	10	20
------	----	--------	-----------------	----	----	----

1215 Format

$NFN(NM, NS(NM), 1) - NFN(NM, NS(NM), MFG(NM, NS(NM)))$

I5 Format

$\sum_{i=1}^{NM} NS(i)$

715 Format

5515	1	1	$MFG(1, 1)$	12	10	20
------	---	---	-------------	----	----	----

1215 Format

$NFG(1, 1, 1) - NFG(1, 1, MFG(1, 1))$

⋮

715 Format

5515	i	j	$MFG(i, j)$	12	10	20
------	---	---	-------------	----	----	----

1215 Format

$NFG(i, j, 1) - NFG(i, j, MFG(i, j))$

⋮

715 Format

5515	NM	$NS(NM)$	$MFG(NM, NS(NM))$	12	10	20
------	----	----------	-------------------	----	----	----

1215 Format

$NFG(NM, NS(NM), 1) - NFG(NM, NS(NM), MFG(NM, NS(NM)))$

I5 Format

NM

7I5 Format

7915	1	1	MLI(1)	1	12	20
------	---	---	--------	---	----	----

12I5 Format

MLI(1, 1) - MLI(1, MLI(1))

⋮

7I5 Format

7915	1	i	MLI(i)	1	12	20
------	---	---	--------	---	----	----

12I5 Format

MLI(i, 1) - MLI(i, MLI(i))

⋮

7I5 Format

7915	1	NM	MLI(NM)	1	12	20
------	---	----	---------	---	----	----

12I5 Format

MLI(NM, 1) - MLI(NM, MLI(NM))

I5 Format

NM

7I5 Format

8215	1	1	MLTP(1)	1	12	20
------	---	---	---------	---	----	----

12I5 Format

MLTP(1, 1) - MLTP(1, MLTP(1))

⋮

7I5 Format

8215	1	i	MLTP(i)	1	12	20
------	---	---	---------	---	----	----

12I5 Format

NLTP(i, 1) - NLTP(i, MLTP(i))

⋮

7I5 Format

8215	1	NM	MLTP(NM)	1	12	20
------	---	----	----------	---	----	----

12I5 Format

NLTP(NM, 1) - NLTP(NM, MLTP(NM))

I5 Format

NM

7I5 Format

8515	1	1	MLTN(1)	1	12	20
------	---	---	---------	---	----	----

12I5 Format

NLTN(1, 1) - NLTN(1, MLTN(1))

⋮

7I5 Format

8515	1	i	MLTN(i)	1	12	20
------	---	---	---------	---	----	----

12I5 Format

NLTN(i, 1) - NLTN(i, MLTN(i))

⋮

8515	1	NM	MLTN(NM)	1	12	20
------	---	----	----------	---	----	----

12I5 Format

NLTN(NM, 1) - NLTN(NM, MLTN(NM))

I5 Format

NM	
$\sum_{i=1}$	NS(i)(NTEMP(i) - 1)

If this card entry = 0 omit and go to (h) otherwise go to (g)

(g)

7I5 Format

8815	N1	NS(N1)	MF(N1, NS(N1))	12	10	20
------	----	--------	----------------	----	----	----

12I5 Format

NF(N1, NS(N1), 1) - NF(N1, NS(N1), MF(N1, NS(N1)))
--

:

7I5 Format

8815	i	j	MF(i, j)	12	10	20
------	---	---	----------	----	----	----

12I5 Format

NF(i, j, 1) - NF(i, j, MF(i, j))

:

7I5 Format

8815	N2	NS(N2)	MF(N2, NS(N2))	12	10	20
------	----	--------	----------------	----	----	----

12I5 Format

NF(N2, NS(N2), 1) - NF(N2, NS(N2), MF(N2, NS(N2)))
--

N1 is first mission with NTEMP(N1) = 2

N2 is last mission with NTEMP(N2) = 2

(h) I5 Format

N3

N3 is the number of missions that have a touch-and-go landing.
If N3 = 0 omit this card and go to (j) otherwise go to (i).

(i) 7I5 Format

11215	1	N4	MTGI(N4)	1	12	20
-------	---	----	----------	---	----	----

12I5 Format

NTGI(N4, 1) - NTGI(N4, MTGI(N4))

⋮

7I5 Format

11215	1	i	MTGI(i)	1	12	20
-------	---	---	---------	---	----	----

12I5 Format

NTGI(i, 1) - NTGI(i, MTGI(i))

⋮

7I5 Format

11215	1	N5	MTGI(N5)	1	12	20
-------	---	----	----------	---	----	----

12I5 Format

NTGI(N5, 1) - NTGI(N5, MTGI(N5))

N4 is first mission with NTG(N4) ≠ 0

N5 is last mission with NTG(N5) ≠ 0

I5 Format

N3

715 Format

11515	1	N4	MTGG(N4)	1	12	20
-------	---	----	----------	---	----	----

1215 Format

NTGG(N4, 1) - NTGG(N4, MTGG(N4))

⋮

715 Format

11515	1	i	MTGG(i)	1	12	20
-------	---	---	---------	---	----	----

1215 Format

NTGG(i, 1) - NTGG(i, MTGG(i))

⋮

715 Format

11515	1	N5	MTGG(N5)	1	12	20
-------	---	----	----------	---	----	----

1215 Format

NTGG(N5, 1) - NTGG(N5, MTGG(N5))

(j)

I5 Format

NM

715 Format

11845	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

1215 Format

MFP(1, 1) - MFP(1, NS(1))

⋮

715 Format

11845	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

1215 Format

MFP(i, 1) - MFP(i, NS(i))

⋮

715 Format

11845	1	NM	NS(NM)	1	12	10
-------	---	----	--------	---	----	----

1215 Format

MFP(NM, 1) - MFP(NM, NS(NM))

I5 Format

NM

715 Format

11965	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

1215 Format

MFN(1, 1) - MFN(1, NS(1))

⋮

715 Format

11965	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

1215 Format

MFN(i, 1) - MFN(i, NS(i))

⋮

715 Format

11965	1	NM	NS(NM)	1	12	10
-------	---	----	--------	---	----	----

1215 Format

MFN(NM, 1) - MFN(NM, NS(NM))

I5 Format

NM

7I5 Format

12085	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

12I5 Format

MFG(1, 1) - MFG(1, NS(1))

⋮

7I5 Format

12085	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

12I5 Format

MFG(1, 1) - MFG(1, NS(1))

⋮

7I5 Format

12085	1	NM	NS(NM)	1	12	10
-------	---	----	--------	---	----	----

12I5 Format

MFG(NM, 1) - MFG(NM, NS(NM))

I5 Format

NM
$\sum_{i=1} (NTEMP(i) - 1)$

If this entry = 0 omit and go to (1) otherwise go to (k)

(k)

7I5 Format

12250	1	N1	NS(N1)	1	12	10
-------	---	----	--------	---	----	----

1215 Format

MF(N1, 1) - MF(N1, NS(N1))

⋮

715 Format

12250	1	1	NS(1)	1	12	10
-------	---	---	-------	---	----	----

1215 Format

MF(i, 1) - MF(i, NS(i))

⋮

715 Format

12250	1	N2	NS(N2)	1	12	10
-------	---	----	--------	---	----	----

1215 Format

MF(N2, 1) - MF(N2, NS(N2))

N1 is first mission with NTEMP(N1) = 2

N2 is last mission with NTEMP(N2) = 2

(1) END OF FILE

The first card contains fourteen (14) fixed point (integer) numbers arranged in 15 fields. These entries are

(1) IDENT - run number

(2) 1

(3) 1

(4) $11 + 2N + 2L$

$N = 1$ if i is in $[1, NM]$ and $NTG(i) \neq 0$

$N = 0$ otherwise

$L = 1$ if $NRANM = 2$

$L = 0$ if $NRANM = 1$

(5) 0

(6) $8 + M + 2N$

$M = 1$ if i is in $[1, NM]$ and $NTEMP(i) = 2$

$M = 0$ otherwise

(7) $13 + 2M + 2N$

(8) MONTH

(9) DAY

(10) YEAR

(11) NCASE

(12) NM

(13) NRAM

(14) 0

The second card contains 515 fields with the following entries

(1) NMTMS

(2) NFLT

(3) NHRS

(4) MISRPT

(5) MNUMS

The third and fourth cards contain run descriptive information as desired by the user.

The fifth and subsequent cards are arranged as shown above.

5 SAMPLE PROBLEM

A sample run is included to acquaint the user with the input deck arrangement and the output listing. The case considered is an aircraft with a lifetime of twelve hours that is comprised of six flights. There are two missions and the mission time and the mission selection is random. A temperature profile is included in mission 1 and both missions contain touch-and-go landings. The input data and the output listing are given below.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			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HUNDRED-SEVEN										THIRTY-SIX HUNDRED-EIGHT										THIRTY-SIX HUNDRED-NINE										THIRTY-SEVEN HUNDRED										THIRTY-SEVEN HUNDRED-ONE										THIRTY-SEVEN HUNDRED-TWO										THIRTY-SEVEN HUNDRED-THREE										THIRTY-SEVEN HUNDRED-FOUR										THIRTY-SEVEN HUNDRED-FIVE										THIRTY-SEVEN HUNDRED-SIX										THIRTY-SEVEN HUNDRED-SEVEN										THIRTY-SEVEN HUNDRED-EIGHT										THIRTY-SEVEN HUNDRED-NINE										THIRTY-EIGHT HUNDRED										THIRTY-EIGHT HUNDRED-ONE										THIRTY-EIGHT HUNDRED-TWO										THIRTY-EIGHT HUNDRED-THREE										THIRTY-EIGHT HUNDRED-FOUR										THIRTY-EIGHT HUNDRED-FIVE										THIRTY-EIGHT HUNDRED-SIX										THIRTY-EIGHT HUNDRED-SEVEN										THIRTY-EIGHT HUNDRED-EIGHT										THIRTY-EIGHT HUNDRED-NINE										THIRTY-NINE HUNDRED										THIRTY-NINE HUNDRED-ONE										THIRTY-NINE HUNDRED-TWO										THIRTY-NINE HUNDRED-THREE										THIRTY-NINE HUNDRED-FOUR										THIRTY-NINE HUNDRED-FIVE										THIRTY-NINE HUNDRED-SIX										THIRTY-NINE HUNDRED-SEVEN										THIRTY-NINE HUNDRED-EIGHT										THIRTY-NINE HUNDRED-NINE										FORTY HUNDRED										FORTY HUNDRED-ONE										FORTY HUNDRED-TWO										FORTY HUNDRED-THREE										FORTY HUNDRED-FOUR										FORTY HUNDRED-FIVE										FORTY HUNDRED-SIX										FORTY HUNDRED-SEVEN										FORTY HUNDRED-EIGHT										FORTY HUNDRED-NINE										FORTY-ONE HUNDRED										FORTY-ONE HUNDRED-ONE										FORTY-ONE HUNDRED-TWO										FORTY-ONE HUNDRED-THREE										FORTY-ONE HUNDRED-FOUR										FORTY-ONE HUNDRED-FIVE										FORTY-ONE HUNDRED-SIX										FORTY-ONE HUNDRED-SEVEN										FORTY-ONE HUNDRED-EIGHT										FORTY-ONE HUNDRED-NINE										FORTY-TWO HUNDRED										FORTY-TWO HUNDRED-ONE										FORTY-TWO HUNDRED-TWO										FORTY-TWO HUNDRED-THREE										FORTY-TWO HUNDRED-FOUR										FORTY-TWO HUNDRED-FIVE										FORTY-TWO HUNDRED-SIX										FORTY-TWO HUNDRED-SEVEN										FORTY-TWO HUNDRED-EIGHT										FORTY-TWO HUNDRED-NINE										FORTY-THREE HUNDRED										FORTY-THREE HUNDRED-ONE										FORTY-THREE HUNDRED-TWO										FORTY-THREE HUNDRED-THREE										FORTY-THREE HUNDRED-FOUR										FORTY-THREE HUNDRED-FIVE										FORTY-THREE HUNDRED-SIX										FORTY-THREE HUNDRED-SEVEN										FORTY-THREE HUNDRED-EIGHT										FORTY-THREE HUNDRED-NINE										FORTY-FOUR HUNDRED										FORTY-FOUR HUNDRED-ONE										FORTY-FOUR HUNDRED-TWO										FORTY-FOUR HUNDRED-THREE										FORTY-FOUR HUNDRED-FOUR										FORTY-FOUR HUNDRED-FIVE										FORTY-FOUR HUNDRED-SIX										FORTY-FOUR HUNDRED-SEVEN										FORTY-FOUR HUNDRED-EIGHT										FORTY-FOUR HUNDRED-NINE										FORTY-FIVE HUNDRED										FORTY-FIVE HUNDRED-ONE										FORTY-FIVE HUNDRED-TWO										FORTY-FIVE HUNDRED-THREE										FORTY-FIVE HUNDRED-FOUR										FORTY-FIVE HUNDRED-FIVE										FORTY-FIVE HUNDRED-SIX										FORTY-FIVE HUNDRED-SEVEN										FORTY-FIVE HUNDRED-EIGHT										FORTY-FIVE HUNDRED-NINE										FORTY-SIX HUNDRED										FORTY-SIX HUNDRED-ONE										FORTY-SIX HUNDRED-TWO										FORTY-SIX HUNDRED-THREE										FORTY-SIX HUNDRED-FOUR										FORTY-SIX HUNDRED-FIVE										FORTY-SIX HUNDRED-SIX										FORTY-SIX HUNDRED-SEVEN										FORTY-SIX HUNDRED-EIGHT										FORTY-SIX HUNDRED-NINE										FORTY-SEVEN HUNDRED										FORTY-SEVEN HUNDRED-ONE										FORTY-SEVEN HUNDRED-TWO										FORTY-SEVEN HUNDRED-THREE										FORTY-SEVEN HUNDRED-FOUR										FORTY-SEVEN HUNDRED-FIVE										FORTY-SEVEN HUNDRED-SIX										FORTY-SEVEN HUNDRED-SEVEN										FORTY-SEVEN HUNDRED-EIGHT										FORTY-SEVEN HUNDRED-NINE										FORTY-EIGHT HUNDRED										FORTY-EIGHT HUNDRED-ONE										FORTY-EIGHT HUNDRED-TWO										FORTY-EIGHT HUNDRED-THREE										FORTY-EIGHT HUNDRED-FOUR										FORTY-EIGHT HUNDRED-FIVE										FORTY-EIGHT HUNDRED-SIX										FORTY-EIGHT HUNDRED-SEVEN										FORTY-EIGHT HUNDRED-EIGHT										FORTY-EIGHT HUNDRED-NINE										FORTY-NINE HUNDRED										FORTY-NINE HUNDRED-ONE										FORTY-NINE HUNDRED-TWO										FORTY-NINE HUNDRED-THREE										FORTY-NINE HUNDRED-FOUR										FORTY-NINE HUNDRED-FIVE										FORTY-NINE HUNDRED-SIX										FORTY-NINE HUNDRED-SEVEN										FORTY-NINE HUNDRED-EIGHT										FORTY-NINE HUNDRED-NINE										FIFTY HUNDRED										FIFTY HUNDRED-ONE										FIFTY HUNDRED-TWO										FIFTY HUNDRED-THREE										FIFTY HUNDRED-FOUR										FIFTY HUNDRED-FIVE										FIFTY HUNDRED-SIX										FIFTY HUNDRED-SEVEN										FIFTY HUNDRED-EIGHT										FIFTY HUNDRED-NINE										FIFTY-ONE HUNDRED										FIFTY-ONE HUNDRED-ONE										FIFTY-ONE HUNDRED-TWO										FIFTY-ONE HUNDRED-THREE										FIFTY-ONE HUNDRED-FOUR										FIFTY-ONE HUNDRED-FIVE										FIFTY-ONE HUNDRED-SIX										FIFTY-ONE HUNDRED-SEVEN										FIFTY-ONE HUNDRED-EIGHT										FIFTY-ONE HUNDRED-NINE										FIFTY-TWO HUNDRED										FIFTY-TWO HUNDRED-ONE										FIFTY-TWO HUNDRED-TWO										FIFTY-TWO HUNDRED-THREE										FIFTY-TWO HUNDRED-FOUR										FIFTY-TWO HUNDRED-FIVE										FIFTY-TWO HUNDRED-SIX										FIFTY-TWO HUNDRED-SEVEN										FIFTY-TWO HUNDRED-EIGHT										FIFTY-TWO HUNDRED-NINE										FIFTY-THREE HUNDRED										FIFTY-THREE HUNDRED-ONE										FIFTY-THREE HUNDRED-TWO										FIFTY-THREE HUNDRED-THREE										FIFTY-THREE HUNDRED-FOUR										FIFTY-THREE HUNDRED-FIVE										FIFTY-THREE HUNDRED-SIX										FIFTY-THREE HUNDRED-SEVEN										FIFTY-THREE HUNDRED-EIGHT										FIFTY-THREE HUNDRED-NINE										FIFTY-FOUR HUNDRED										FIFTY-FOUR HUNDRED-ONE										FIFTY-FOUR HUNDRED-TWO										FIFTY-FOUR HUNDRED-THREE										FIFTY-FOUR HUNDRED-FOUR										FIFTY-FOUR HUNDRED-FIVE										FIFTY-FOUR HUNDRED-SIX										FIFTY-FOUR HUNDRED-SEVEN										FIFTY-FOUR HUNDRED-EIGHT										FIFTY-FOUR HUNDRED-NINE										FIFTY-FIVE HUNDRED										FIFTY-FIVE HUNDRED-ONE										FIFTY-FIVE HUNDRED-TWO										FIFTY-FIVE HUNDRED-THREE										FIFTY-FIVE HUNDRED-FOUR										FIFTY-FIVE HUNDRED-FIVE										FIFTY-FIVE HUNDRED-SIX										FIFTY-FIVE HUNDRED-SEVEN										FIFTY-FIVE HUNDRED-EIGHT										FIFTY-FIVE HUNDRED-NINE										FIFTY-SIX HUNDRED										FIFTY-SIX HUNDRED-ONE										FIFTY-SIX HUNDRED-TWO										FIFTY-SIX HUNDRED-THREE										FIFTY-SIX HUNDRED-FOUR										FIFTY-SIX HUNDRED-FIVE										FIFTY-SIX HUNDRED-SIX										FIFTY-SIX HUNDRED-SEVEN										FIFTY-SIX HUNDRED-EIGHT										FIFTY-SIX HUNDRED-NINE										FIFTY-SEVEN HUNDRED										FIFTY-SEVEN HUNDRED-ONE										FIFTY-SEVEN HUNDRED-TWO										FIFTY-SEVEN HUNDRED-THREE										FIFTY-SEVEN HUNDRED-FOUR										FIFTY-SEVEN HUNDRED-FIVE									

5000.0	6000.0	1	2	12	10	20	CI	SPM	1
3115	2	1	2	12	10	20	CI	SPM	2
6000.0	6000.0	1	2	12	10	20	CI	SPM	3
3115	2	2	2	12	10	20	CI	SPM	4
6000.0	6000.0	1	2	12	10	20	CI	SPM	5
5515	1	1	2	12	10	20	CI	SPM	6
7400.0	7400.0	1	2	12	10	20	CI	SPM	7
5515	1	2	3	12	10	20	CI	SPM	8
10000.0	11000.0	1	2	12	10	20	CI	SPM	9
5515	1	3	2	12	10	20	CI	SPM	10
7700.0	7000.0	1	2	12	10	20	CI	SPM	11
5515	2	1	1	12	10	20	CI	SPM	12
10200.0	9000.0	1	2	12	10	20	CI	SPM	13
5515	2	3	12	10	20	CI	SPM	14	14
9000.0	9000.0	1	2	12	10	20	CI	SPM	15
6015	1	1	2	12	10	20	CI	SPM	16
250.0	270.0	1	2	12	10	20	CI	SPM	17
5015	1	2	1	12	10	20	CI	SPM	18
260.0	1	1	3	12	10	20	CI	SPM	19
6015	1	3	12	10	20	CI	SPM	20	20
255.0	255.0	1	2	12	10	20	CI	SPM	21
7015	1	1	1	12	10	20	CI	SPM	22
15000.0	15000.0	1	2	12	10	20	CI	SPM	23
7015	1	2	2	1	12	20	CI	SPM	24
17000.0	19000.0	1	2	1	12	20	CI	SPM	25
8215	1	1	3	1	12	20	CI	SPM	26
8100.0	8000.0	1	2	1	12	20	CI	SPM	27
8215	1	2	2	1	12	20	CI	SPM	28
7700.0	7400.0	1	2	1	12	20	CI	SPM	29
8515	1	1	3	1	12	20	CI	SPM	30
11200	11000.0	1	2	1	12	20	CI	SPM	31
8515	1	2	3	1	12	20	CI	SPM	32
10200.0	10000.0	1	2	1	12	20	CI	SPM	33
11215	1	1	1	1	12	20	CI	SPM	34
17500.0	17500.0	1	2	1	12	20	CI	SPM	35
11215	1	2	2	1	12	20	CI	SPM	36
11200.0	19500.0	1	2	1	12	20	CI	SPM	37
11515	1	1	1	1	12	20	CI	SPM	38
6000.0	6000.0	1	2	1	12	20	CI	SPM	39
11515	1	2	2	1	12	20	CI	SPM	40
6700.0	6000.0	1	2	1	12	20	CI	SPM	41
12000	1	1	3	1	12	10	CI	SPM	42
12000	1	2	2	3	12	10	CI	SPM	43
12000	1	3	3	3	12	10	CI	SPM	44
12000	2	1	3	3	12	10	CI	SPM	45
12000	2	2	2	3	12	10	CI	SPM	46
12000	2	3	3	3	12	10	CI	SPM	47
12000	2	4	4	4	4	4	CI	SPM	48
12000	1	1	3	3	12	10	CI	SPM	49
12000	1	1	1	1	12	10	CI	SPM	50

REP. NO. 1 DATE 12/3/1973 PAGE NO. 1
 TEST CASE FOR FLIGHT-FLIGHT SPECTRUM OF LOADS AND TEMP.
 STRESS IN PSI 12-7A IN DEGREES F
 STRESS SPECTRA DERIVED FROM ELY RECORDER DATA
 SPECTRUM BASED ON 5 PALENTS AND 12 HOURS IN ONE LIFE TIME
 MISSION SPECTRUM IS RANDOM
 MISSION NO. REPEATS/LIFE 2
 MISSION NO. REPEATS/LIFE 2
 MISSION TIME IS RANDOM
 NUMBER OF MISSION TIME INTERVALS 2
 MISSION TIME ORIGIN (IN NEXT PAGE)

RUN NO 1 DATE 12/3/1973 PAGE NO 3
 MISSION NUMBER 1
 TAKE-OFF TAXI MAXIMUM PER FLIGHT = 5
 NUMBER OF INTERVALS IN MISSION = 3
 MISSION INTERVAL NO 1
 INTERVAL NO FLY LOADS/FLY INTERVAL NO FLY LOADS/FLY
 MISSION INTERVAL NO 2
 INTERVAL NO FLY LOADS/FLY INTERVAL NO FLY LOADS/FLY
 MISSION INTERVAL NO 3
 INTERVAL NO FLY LOADS/FLY INTERVAL NO FLY LOADS/FLY
 LANDING TAXI MAXIMUM PER FLIGHT = 3
 NUMBER OF TOUCH-DOWN-AND-GO LANDINGS PER FLIGHT = 1
 TEMPERATURE PROFILE INCLUDED
 STRESS AT REST IN TAKE-OFF CONFIGURATION = -10000.
 TAKE-OFF TAXI MAXIMUM LOAD SPECTRUM
 STRESS -5000.
 NUMBER OF OCCURRENCES AT EACH STRESS 2
 TAKE-OFF TAXI MINIMUM LOAD SPECTRUM
 STRESS -5000.
 NUMBER OF OCCURRENCES AT EACH STRESS 2

RUN NO	1	DATE	12/3/1973	PAGE NO	4
MISSION NUMBER 1					
FLIGHT MAXIMUM LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS 25000 27000					
NUMBER OF OCCURRENCES AT EACH STRESS 6					
FLIGHT MINIMUM LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS 7000 8000					
NUMBER OF OCCURRENCES AT EACH STRESS 2 1					
FLIGHT ONE G LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS 7000					
NUMBER OF OCCURRENCES AT EACH STRESS 1 2					
FLIGHT TEMPERATURE SPECTRUM					
INTERVAL NUMBER 1					
TEMPERATURE 250 270					
NUMBER OF OCCURRENCES AT EACH TEMPERATURE 6 1					

RUN NO	1	DATE	10/ 3/03	PAGE NO	1
MISSION NUMBER 1					
FLIGHT MAXIMUM LOAD SPECTRUM					
INTERVAL NUMBER 2					
STRESS 2000					
NUMBER OF OCCURRENCES AT EACH STRESS 8					
FLIGHT MINIMUM LOAD SPECTRUM					
INTERVAL NUMBER 2					
STRESS 7500					
NUMBER OF OCCURRENCES AT EACH STRESS 2					
FLIGHT ONE G LOAD SPECTRUM					
INTERVAL NUMBER 2					
STRESS 10000					
NUMBER OF OCCURRENCES AT EACH STRESS 2					
FLIGHT TEMPERATURE SPECTRUM					
INTERVAL NUMBER 2					
TEMPERATURE					
NUMBER OF OCCURRENCES AT EACH TEMPERATURE 24					

DOC NO	1	DATE	12/ 31/1973	PAGE NO	8
MISSION NUMBER	1				
FLIGHT MAXIMUM LOAD SPECTRUM					
INTERVAL NUMBER	3				
STRESS					
2000	2000	1000			
NUMBER OF OCCURRENCES AT EACH STRESS					
3	3	6			
FLIGHT MINIMUM LOAD SPECTRUM					
INTERVAL NUMBER	3				
STRESS					
5000	4000				
NUMBER OF OCCURRENCES AT EACH STRESS					
1	2				
FLIGHT ONE G LOAD SPECTRUM					
INTERVAL NUMBER	3				
STRESS					
0700	7000				
NUMBER OF OCCURRENCES AT EACH STRESS					
7	2				
FLIGHT TEMPERATURE SPECTRUM					
INTERVAL NUMBER	3				
TEMPERATURE					
255	205	275			
NUMBER OF OCCURRENCES AT EACH TEMPERATURE					
10	7	7			

RUN NO	1	DATE	12/3/1973	PAGE NO	7
MISSION NUMBER	1				
TRUCK-AND-GO LANDING IMPACT LOAD SPECTRUM					
STRESS	-17500				
NUMBER OF OCCURRENCES AT EACH STRESS	2				
TUG-AND-GO LANDING ONE G SPECTRUM					
STRESS	0000				
NUMBER OF OCCURRENCES AT EACH STRESS	2				
LANDING IMPACT LOAD SPECTRUM					
STRESS	-15000				
NUMBER OF OCCURRENCES AT EACH STRESS	2				
LANDING TAKE MAXIMUM LOAD SPECTRUM					
STRESS	-0100	-0400	-0700		
NUMBER OF OCCURRENCES AT EACH STRESS	1	3	2		
LANDING TAKE MINIMUM LOAD SPECTRUM					
STRESS	-112000	-11000	-11000		
NUMBER OF OCCURRENCES AT EACH STRESS	3	2	1		
GROUND CONDITION TEMPERATURE = 59.					

RUN NO	1	DATE	12/17/73	PAGE NO	1
MISSION NUMBER	2				
TAKE-OFF TAXI MAXIMUMS PER FLIGHT = 0					
NUMBER OF INTERVALS IN MISSION = 2					
MISSION INTERVAL NO					
INTERVAL NO	1	FLY LOADS/FLY	INTERVAL NO	2	FLY LOADS/FLY
INTERVAL NO	1	FLY LOADS/FLY	INTERVAL NO	2	FLY LOADS/FLY
MISSION INTERVAL NO					
INTERVAL NO	1	FLY LOADS/FLY	INTERVAL NO	2	FLY LOADS/FLY
INTERVAL NO	1	FLY LOADS/FLY	INTERVAL NO	2	FLY LOADS/FLY
LANDING TAXI MAXIMUMS PER FLIGHT = 5					
NUMBER OF TOUCH-DOWN GO LANDINGS PER FLIGHT = 2					
TEMPERATURE PROFILE NOT INCLUDED					
STRESS AT REST IN TAKE-OFF CONFIGURATION = -12000					
TAKE-OFF TAXI MAXIMUM LOAD SPECTRUM					
STRESS					
-2000 -7000 -8000					
NUMBER OF OCCURRENCES AT EACH STRESS					
0 0 0					
TAKE-OFF TAXI MINIMUM LOAD SPECTRUM					
STRESS					
-2000 -5000 -10000 -12000					
NUMBER OF OCCURRENCES AT EACH STRESS					
2 2 2					

RUN NO	1	DATE	12/ 1/1973	PAGE NO	9
MISSION NUMBER 2					
FLIGHT MAXIMUM LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS					
20000	10000	NUMBER OF OCCURRENCES AT EACH STRESS			
0					
FLIGHT MINIMUM LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS					
20000	10000	NUMBER OF OCCURRENCES AT EACH STRESS			
0					
FLIGHT ONE G LOAD SPECTRUM					
INTERVAL NUMBER 1					
STRESS					
10000	NUMBER OF OCCURRENCES AT EACH STRESS				
0					

RUN NO	1	DATE	12/17/73	PAGE NO	10
MISSION NUMBER 2					
FLIGHT MAXIMUM LOAD SPECTRUM					
INTERVAL NUMBER	2				
STRESS					
2000	2000	2000	2000	2000	
NUMBER OF OCCURRENCES AT EACH STRESS					
4	4	4	4	4	4
FLIGHT MINIMUM LOAD SPECTRUM					
INTERVAL NUMBER	2				
STRESS					
2000	2000	2000	2000	2000	
NUMBER OF OCCURRENCES AT EACH STRESS					
4	4	4	4	4	4
FLIGHT ONE G LOAD SPECTRUM					
INTERVAL NUMBER	2				
STRESS					
2000	2000	2000	2000	2000	
NUMBER OF OCCURRENCES AT EACH STRESS					
4	4	4	4	4	4

RUN NO	1	DATE	12/ 3/1973	PAGE NO	11
MISSION NUMBER	2				
LONG-RAMP-50 LANDING IMPACT LOAD SPECTRUM					
STRESS	-16500				
NUMBER OF OCCURRENCES AT EACH STRESS	4				
LONG-RAMP-50 LANDING ONE G SPECTRUM					
STRESS	4200				
NUMBER OF OCCURRENCES AT EACH STRESS	4				
LANDING IMPACT LOAD SPECTRUM					
STRESS	-17000				
NUMBER OF OCCURRENCES AT EACH STRESS	1				
LANDING TAXI MAXIMUM LOAD SPECTRUM					
STRESS	-7100				
NUMBER OF OCCURRENCES AT EACH STRESS	10				
LANDING TAXI MINIMUM LOAD SPECTRUM					
STRESS	-10200				
NUMBER OF OCCURRENCES AT EACH STRESS	5				
GROUND CONDITION TEMPERATURE = 50°					

RUN NO 1 DATE 12/1/1973 PAGE NO 12
 FLIGHT-STEADY LOAD AND TEMPERATURE REQUIRE
 FLIGHT NUMBER 1
 MISSION NUMBER 1
 NUMBER OF LOADS 50

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-10000	59	26	-10000	59
2	-5000	59	27	-8000	59
3	-5000	59	28	-8000	59
4	-5000	59	29	-8000	59
5	-5000	59	30	-8000	59
6	-5000	59	31	-8000	59
7	-5000	59	32	-8000	59
8	-5000	59	33	-8000	59
9	-5000	59	34	-8000	59
10	-5000	59	35	-8000	59
11	-5000	59	36	-8000	59
12	-5000	59	37	-8000	59
13	-5000	59	38	-8000	59
14	-5000	59	39	-8000	59
15	-5000	59	40	-8000	59
16	-5000	59	41	-8000	59
17	-5000	59	42	-8000	59
18	-5000	59	43	-8000	59
19	-5000	59	44	-8000	59
20	-5000	59	45	-8000	59
21	-5000	59	46	-8000	59
22	-5000	59	47	-8000	59
23	-5000	59	48	-8000	59
24	-5000	59	49	-8000	59
25	-5000	59	50	-8000	59
26	-5000	59			
27	-5000	59			
28	-5000	59			
29	-5000	59			
30	-5000	59			
31	-5000	59			
32	-5000	59			
33	-5000	59			
34	-5000	59			
35	-5000	59			
36	-5000	59			
37	-5000	59			
38	-5000	59			
39	-5000	59			
40	-5000	59			
41	-5000	59			
42	-5000	59			
43	-5000	59			
44	-5000	59			
45	-5000	59			
46	-5000	59			
47	-5000	59			
48	-5000	59			
49	-5000	59			
50	-5000	59			

FLIGHT-STEERING LOAD AND TEMPERATURE SEQUENCE

FLIGHT NUMBER 8

MISSION NUMBER 2

NUMBER OF LOADS 49

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000	59	2	-8000	59	3	-12000	59
4	-2000	59	5	-12000	59	6	-12000	59
7	-7000	59	8	-7000	59	9	-12000	59
10	2000	59	11	6000	59	12	2000	59
13	10200	59	14	3200	59	15	10200	59
16	2000	59	17	9000	59	18	10200	59
19	2000	59	20	3000	59	21	4000	59
22	2000	59	23	8000	59	24	2000	59
25	9000	59	26	-19500	59	27	6700	59
28	-10500	59	29	-6700	59	30	-17000	59
31	-2100	59	32	-2000	59	33	-7190	59
34	-10200	59	35	-7000	59	36	-10200	59
37	-2100	59	38	-10200	59	39	-7100	59
40	-13000	59	41	9700	205	42	31000	205

RUN NO 1 DATE 12/3/1973 PAGE NO 18

FLIGHT-FLIGHT LOAD AND TEMPERATURE SCHEDULE

FLIGHT NUMBER 3
MISSION NUMBER 1
NUMBER OF LOADS 46

LOAD NUMBER	STR-33	TEMP	LOAD NUMBER	STR-33	TEMP	LOAD NUMBER	STR-33	TEMP
1	-10000	59	1	-5000	59	1	-6000	59
4	-5000	59	2	-5000	59	2	-5000	59
7	-5000	59	5	-5000	59	5	-5000	59
10	-5000	59	8	-5000	59	8	-5000	59
13	-5000	59	11	-5000	59	11	-5000	59
16	-5000	59	14	-5000	59	14	-5000	59
19	-5000	59	17	-5000	59	17	-5000	59
22	-5000	59	20	-5000	59	20	-5000	59
25	-5000	59	23	-5000	59	23	-5000	59
28	-5000	59	26	-5000	59	26	-5000	59
31	-5000	59	29	-5000	59	29	-5000	59
34	-5000	59	32	-5000	59	32	-5000	59
37	-5000	59	35	-5000	59	35	-5000	59
40	-5000	59	38	-5000	59	38	-5000	59
43	-5000	59	41	-5000	59	41	-5000	59
46	-5000	59	44	-5000	59	44	-5000	59
			47	-5000	59	47	-5000	59

FLIGHT-AN-FLIGHT LOAD AND TEMPERATURE SEQUENCE

FLIGHT NUMBER 4
 FLIGHT NUMBER 2
 NUMBER OF LOADS 36

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	2	-7000.	59.
3	-12000.	59.	4	-8000.	59.
5	-12000.	59.	6	-8000.	59.
7	-11000.	59.	8	-6000.	59.
9	-12000.	59.	10	-12000.	59.
11	-6200.	59.	12	29000.	59.
13	10200.	59.	14	20000.	59.
15	20000.	59.	16	20000.	59.
17	20000.	59.	18	20000.	59.
19	20000.	59.	20	20000.	59.
21	20000.	59.	22	20000.	59.
23	20000.	59.	24	20000.	59.
25	20000.	59.	26	20000.	59.
27	20000.	59.	28	20000.	59.
29	20000.	59.	30	20000.	59.
31	20000.	59.	32	20000.	59.
33	20000.	59.	34	20000.	59.
35	20000.	59.	36	20000.	59.

RUN NO 1 DATE 12/3/1973 PAGE NO 14
 FLIGHT-AT-ILLIGHT LOAD AND TEMPERATURE SEQUENCE
 FLIGHT NUMBER = 5
 MISSION NUMBER = 2
 NUMBER OF LOADS = 36

LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000	59	2	-7000	59	3	-12000	59
4	-8000	59	5	-7000	59	6	-7000	59
7	-12000	59	8	-8000	59	9	-9000	59
10	20000	59	11	8000	59	12	32000	59
13	10200	59	14	20000	59	15	10200	59
16	30000	59	17	8000	59	18	20000	59
19	8000	59	20	20500	59	21	4000	59
22	-19500	59	23	8000	59	24	-18500	59
25	6000	59	26	-10000	59	27	-7100	59
28	-10200	59	29	-7400	59	30	-10200	59
31	-27100	59	32	-12200	59	33	-27400	59
34	-10200	59	35	-11100	59	36	-10800	59

RUN NO. 1 DATE 12/3/1973 PAGE NO. 17
 FLIGHT-5-FLIGHT LOAD AND TEMPERATURE SEQUENCE
 FLIGHT NUMBER 5
 MISSION NUMBER 2
 NUMBER OF LOADS 50

LOAD NUMBER	AIRSB	TEMP	LOAD NUMBER	STRESS	TEMP	LOAD NUMBER	STRESS	TEMP
1	-12000.	59.	1	-7300.	59.	1	-9000.	59.
2	-12000.	59.	2	-7300.	59.	2	-9000.	59.
3	-12000.	59.	3	-7300.	59.	3	-9000.	59.
4	-12000.	59.	4	-7300.	59.	4	-9000.	59.
5	-12000.	59.	5	-7300.	59.	5	-9000.	59.
6	-12000.	59.	6	-7300.	59.	6	-9000.	59.
7	-12000.	59.	7	-7300.	59.	7	-9000.	59.
8	-12000.	59.	8	-7300.	59.	8	-9000.	59.
9	-12000.	59.	9	-7300.	59.	9	-9000.	59.
10	-12000.	59.	10	-7300.	59.	10	-9000.	59.
11	-12000.	59.	11	-7300.	59.	11	-9000.	59.
12	-12000.	59.	12	-7300.	59.	12	-9000.	59.
13	-12000.	59.	13	-7300.	59.	13	-9000.	59.
14	-12000.	59.	14	-7300.	59.	14	-9000.	59.
15	-12000.	59.	15	-7300.	59.	15	-9000.	59.
16	-12000.	59.	16	-7300.	59.	16	-9000.	59.
17	-12000.	59.	17	-7300.	59.	17	-9000.	59.
18	-12000.	59.	18	-7300.	59.	18	-9000.	59.
19	-12000.	59.	19	-7300.	59.	19	-9000.	59.
20	-12000.	59.	20	-7300.	59.	20	-9000.	59.
21	-12000.	59.	21	-7300.	59.	21	-9000.	59.
22	-12000.	59.	22	-7300.	59.	22	-9000.	59.
23	-12000.	59.	23	-7300.	59.	23	-9000.	59.
24	-12000.	59.	24	-7300.	59.	24	-9000.	59.
25	-12000.	59.	25	-7300.	59.	25	-9000.	59.
26	-12000.	59.	26	-7300.	59.	26	-9000.	59.
27	-12000.	59.	27	-7300.	59.	27	-9000.	59.
28	-12000.	59.	28	-7300.	59.	28	-9000.	59.
29	-12000.	59.	29	-7300.	59.	29	-9000.	59.
30	-12000.	59.	30	-7300.	59.	30	-9000.	59.
31	-12000.	59.	31	-7300.	59.	31	-9000.	59.
32	-12000.	59.	32	-7300.	59.	32	-9000.	59.
33	-12000.	59.	33	-7300.	59.	33	-9000.	59.
34	-12000.	59.	34	-7300.	59.	34	-9000.	59.
35	-12000.	59.	35	-7300.	59.	35	-9000.	59.
36	-12000.	59.	36	-7300.	59.	36	-9000.	59.
37	-12000.	59.	37	-7300.	59.	37	-9000.	59.
38	-12000.	59.	38	-7300.	59.	38	-9000.	59.
39	-12000.	59.	39	-7300.	59.	39	-9000.	59.
40	-12000.	59.	40	-7300.	59.	40	-9000.	59.
41	-12000.	59.	41	-7300.	59.	41	-9000.	59.
42	-12000.	59.	42	-7300.	59.	42	-9000.	59.
43	-12000.	59.	43	-7300.	59.	43	-9000.	59.
44	-12000.	59.	44	-7300.	59.	44	-9000.	59.
45	-12000.	59.	45	-7300.	59.	45	-9000.	59.
46	-12000.	59.	46	-7300.	59.	46	-9000.	59.
47	-12000.	59.	47	-7300.	59.	47	-9000.	59.
48	-12000.	59.	48	-7300.	59.	48	-9000.	59.
49	-12000.	59.	49	-7300.	59.	49	-9000.	59.
50	-12000.	59.	50	-7300.	59.	50	-9000.	59.

As noted in the introduction, the spectrum printout as given by this routine may not be useful for subsequent use in fatigue or fracture mechanics calculation. It should not be difficult, however, to modify this program to form the desired linkage through magnetic tape or other device.

IV REFERENCES

1. Lincoln, John W., ASD-TR-80-5037, Development of an Aircraft Maneuver Load Spectrum Based on VGH Data, July 1980.

APPENDIX - SPECF PROGRAM LISTING

This listing given below is a FORTRAN extended language routine. The DIMENSION statements are set up for an aircraft flying twelve missions with ten mission intervals each. The EQUIVALENCE statements are compatible with a spectrum for fifteen missions with eight mission intervals in each mission. Consequently, this case may be analyzed with a simple DIMENSION statement change.

PROGRAM SPEC		747A	OPT01	PIN 4000000	02/01/74	17.37.15.	PAGE	1
PROGRAM SPEC (INPUT, OUTPUT, TAPE, INPUT, TAPE, OUTPUT)								
PROGRAM FOR COMPUTING FLIGHT-BY-FLIGHT LOADING SEQUENCE								
FOR A FATIGUE TEST								
5								MAIN 1
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								MAIN 251

SUBROUTINE GUIDE		SUBROUTINE GUIDE	
SUBROUTINE FOR CALLING INPUT DATA AND CALCULATION ROUTINES		SUBROUTINE GUIDE	
COMMON P(13000), M(13500)		COMMON P(13000), M(13500)	SLIDE 1
EQUIVALENCE (M(00), ZERO)		EQUIVALENCE (M(00), ZERO)	SLIDE 2
IF (MZERO) GO 10		IF (MZERO) GO 10	SLIDE 3
DO 20 I = 1, 13000		DO 20 I = 1, 13000	SLIDE 4
P(I) = 0.0		P(I) = 0.0	SLIDE 5
DO 30 J = 1, 13500		DO 30 J = 1, 13500	SLIDE 6
M(J) = 0.0		M(J) = 0.0	SLIDE 7
GO 10 40		GO 10 40	SLIDE 8
DO 50 I = 11015, 13000		DO 50 I = 11015, 13000	SLIDE 9
P(I) = 9.0		P(I) = 9.0	SLIDE 10
CALL INPUT		CALL INPUT	SLIDE 11
CALL COMP		CALL COMP	SLIDE 12
CALL CALC		CALL CALC	SLIDE 13
RETURN		RETURN	SLIDE 14
END		END	SLIDE 15

SUBROUTINE INPUT		74/76	07/81	FIN 4,6,9,353	02/01/76	17,37,46.	PAGE	1
SUBROUTINE INPUT								
COMMON P(13000), N(13500)								
INTEGER DAY, YEAR								
EQUIVALENCE (N(1), IDENT), (N(2), NPF1),								
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	C		M(25415) = MP(1,1,1)	0		DEIN 125
	C		M(25615) = MP(1,1,1)	0		DEIN 126
	C		M(25815) = MP(1,1,1)	0		DEIN 127
160	C		M(26015) = MP(1,1,1)	0		DEIN 128
	C		M(26215) = MP(1,1,1)	0		DEIN 129
	C		M(26415) = MP(1,1,1)	0		DEIN 130
	C		M(26615) = MP(1,1,1)	0		DEIN 131
165	C		M(26815) = MP(1,1,1)	0		DEIN 132
	C		M(27015) = MP(1,1,1)	0		DEIN 133
	C		M(27215) = MP(1,1,1)	0		DEIN 134
	C		M(27415) = MP(1,1,1)	0		DEIN 135
170	C		M(27615) = MP(1,1,1)	0		DEIN 136
	C		M(27815) = MP(1,1,1)	0		DEIN 137
	C		M(28015) = MP(1,1,1)	0		DEIN 138
	C		M(28215) = MP(1,1,1)	0		DEIN 139
175	C		M(28415) = MP(1,1,1)	0		DEIN 140
	C		M(28615) = MP(1,1,1)	0		DEIN 141
	C		M(28815) = MP(1,1,1)	0		DEIN 142
	C		M(29015) = MP(1,1,1)	0		DEIN 143
180	C		M(29215) = MP(1,1,1)	0		DEIN 144
	C		M(29415) = MP(1,1,1)	0		DEIN 145
	C		M(29615) = MP(1,1,1)	0		DEIN 146
	C		M(29815) = MP(1,1,1)	0		DEIN 147
185	C		M(30015) = MP(1,1,1)	0		DEIN 148
	C		M(30215) = MP(1,1,1)	0		DEIN 149
	C		M(30415) = MP(1,1,1)	0		DEIN 150
	C		M(30615) = MP(1,1,1)	0		DEIN 151
190	C		M(30815) = MP(1,1,1)	0		DEIN 152
	C		M(31015) = MP(1,1,1)	0		DEIN 153
	C		M(31215) = MP(1,1,1)	0		DEIN 154
	C		M(31415) = MP(1,1,1)	0		DEIN 155
195	C		M(31615) = MP(1,1,1)	0		DEIN 156
	C		M(31815) = MP(1,1,1)	0		DEIN 157
	C		M(32015) = MP(1,1,1)	0		DEIN 158
	C		M(32215) = MP(1,1,1)	0		DEIN 159
200	C		M(32415) = MP(1,1,1)	0		DEIN 160
	C		M(32615) = MP(1,1,1)	0		DEIN 161
	C		M(32815) = MP(1,1,1)	0		DEIN 162
	C		M(33015) = MP(1,1,1)	0		DEIN 163
205	C		M(33215) = MP(1,1,1)	0		DEIN 164
	C		M(33415) = MP(1,1,1)	0		DEIN 165
	C		M(33615) = MP(1,1,1)	0		DEIN 166
	C		M(33815) = MP(1,1,1)	0		DEIN 167
210	C		M(34015) = MP(1,1,1)	0		DEIN 168
	C		M(34215) = MP(1,1,1)	0		DEIN 169
	C		M(34415) = MP(1,1,1)	0		DEIN 170
	C		M(34615) = MP(1,1,1)	0		DEIN 171
215	C		M(34815) = MP(1,1,1)	0		DEIN 172
	C		M(35015) = MP(1,1,1)	0		DEIN 173
	C		M(35215) = MP(1,1,1)	0		DEIN 174
	C		M(35415) = MP(1,1,1)	0		DEIN 175
220	C		M(35615) = MP(1,1,1)	0		DEIN 176
	C		M(35815) = MP(1,1,1)	0		DEIN 177
	C		M(36015) = MP(1,1,1)	0		DEIN 178
	C		M(36215) = MP(1,1,1)	0		DEIN 179
225	C		M(36415) = MP(1,1,1)	0		DEIN 180
	C		M(36615) = MP(1,1,1)	0		DEIN 181
	C		M(36815) = MP(1,1,1)	0		DEIN 182
	C		M(37015) = MP(1,1,1)	0		DEIN 183
230	C		M(37215) = MP(1,1,1)	0		DEIN 184
	C		M(37415) = MP(1,1,1)	0		DEIN 185
	C		M(37615) = MP(1,1,1)	0		DEIN 186
	C		M(37815) = MP(1,1,1)	0		DEIN 187
235	C		M(38015) = MP(1,1,1)	0		DEIN 188
	C		M(38215) = MP(1,1,1)	0		DEIN 189
	C		M(38415) = MP(1,1,1)	0		DEIN 190
	C		M(38615) = MP(1,1,1)	0		DEIN 191
240	C		M(38815) = MP(1,1,1)	0		DEIN 192
	C		M(39015) = MP(1,1,1)	0		DEIN 193
	C		M(39215) = MP(1,1,1)	0		DEIN 194
	C		M(39415) = MP(1,1,1)	0		DEIN 195
245	C		M(39615) = MP(1,1,1)	0		DEIN 196
	C		M(39815) = MP(1,1,1)	0		DEIN 197
	C		M(40015) = MP(1,1,1)	0		DEIN 198
	C		M(40215) = MP(1,1,1)	0		DEIN 199
250	C		M(40415) = MP(1,1,1)	0		DEIN 200
	C		M(40615) = MP(1,1,1)	0		DEIN 201
	C		M(40815) = MP(1,1,1)	0		DEIN 202
	C		M(41015) = MP(1,1,1)	0		DEIN 203
255	C		M(41215) = MP(1,1,1)	0		DEIN 204
	C		M(41415) = MP(1,1,1)	0		DEIN 205
	C		M(41615) = MP(1,1,1)	0		DEIN 206
	C		M(41815) = MP(1,1,1)	0		DEIN 207
260	C		M(42015) = MP(1,1,1)	0		DEIN 208
	C		M(42215) = MP(1,1,1)	0		DEIN 209
	C		M(42415) = MP(1,1,1)	0		DEIN 210
	C		M(42615) = MP(1,1,1)	0		DEIN 211
265	C		M(42815) = MP(1,1,1)	0		DEIN 212
	C		M(43015) = MP(1,1,1)	0		DEIN 213
	C		M(43215) = MP(1,1,1)	0		DEIN 214
	C		M(43415) = MP(1,1,1)			

SUBROUTINE TGAIO		74/75	QNTI	PPN 2,02333	32/0179 17,37,26.	PAGE 1
SUBROUTINE TGAIO						
SUBROUTINE TGAIO						
COMMON P(13000), M(13500)						
INTEGER DAY, YEAR						
DIMENSION SH(12), STP(12,10,20), BTM(12,20),						
1 STP(12,10,20), STN(12,10,20), STF(12,10,20),						
2 STP(12,20), BLN(12,20), Y(12,10,20), STFC(12,20),						
3 STGC(12,20)						
DIMENSION NITP(12,20), NITM(12,20), NFB(12,10,20),						
1 MFA(12,10,20), MFG(12,10,20), NLT(12,20), NLTp(12,20),						
2 NLTp(12,20), NLT(12,20), NTC(12,20), NTC(12,20),						
3 NITP(12), NITM(12), NFB(12,10), MFB(12,10),						
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90      WRITE (6,100) I, NUMML(I), I+1, NUMML(I+1)      INAD 56
100     FORMAT (I20, I10, I20, I10)                     INAD 57
110     GO TO 150
120     WRITE (6,120) NUMML, NISORT                      INAD 58
130     FORMAY (I10X, 32MISSION SELECTION IS NONRANDOM    INAD 59
1      1 710X, 32NUMBER OF DIFFERENT MISSIONS IN A SEQUENCE =, INAD 60
2      2 15, 710X, 32NUMBER OF TIMES MISSION SEQUENCE IS REPEATED =, INAD 61
3      3 15)                                             INAD 62
65      WRITE (6,130)                                     INAD 63
130     FORMAY (I10X, 32MISSION SEQUENCE ORDER AND NUMBER OF REPEATS) INAD 64
135     DO 135 I = 1, NUMML, 4                             INAD 65
140     WRITE (6,140) I, NUMML(I), NUMML(I+1), INAD 66
145     1  NUMML(I+1), 152, NUMML(I+2), NUMML(I+3), INAD 67
2     NUMML(I+4)
150     IF (NUMML - 1) 140, 210
160     WRITE (6,170) NUMML
170     FORMAY (I10X, 32MISSION TIME IS RANDOM           INAD 71
1      1 710X, 32NUMBER OF MISSION TIME INTERVALS =, 15 INAD 72
2      2 15, 710X, 32MISSION TIME DISTRIBUTION ON NEXT PAGE) INAD 73
180     NPAGE = NPAGE + 1
190     CALL PAGEHO
200     DO 190 I = 1, NM
210     N1 = N1(I)
220     DO 190 J = 1, N1
230     WRITE (6,180) I, J
240     FORMAY (I10X, 32MISSION NUMBER, 15, 2X,          INAD 74
1      1 14MISSION INTERVAL NO, 15)                     INAD 75
185     WRITE (6,185)
190     FORMAY (I10X, 32INTERVAL NO, 2X, 32NUMBER/LIFE, 2X, INAD 76
1      1 11INTERVAL NO, 2X, 11NUMBER/LIFE, 2X, 11INTERVAL NO, INAD 77
2      2 2X, 11NUMBER/LIFE)
200     DO 190 K = 1, NUMML, 3
210     R2 = K + 2
220     R1 = K + 1
230     WRITE (6,200) K, MFRAC(K,I), R1, MFRAC(R1,I), INAD 78
1      1 102, MFRAC(K,I), 515)
200     FORMAY (I21, 515)
210     GO TO 225
220     WRITE (6,220)
230     FORMAY (I10X, 32MISSION TIME IS NONRANDOM)         INAD 81
240     WRITE (I10X, 32MISSION LOAD AND TEMPERATURE OCCURRENCES) INAD 82
250     DO 240 I = 1, NM
260     NPAGE = NPAGE + 1
270     CALL PAGEHO
280     WRITE (6,280)
290     FORMAY (I10X, 32MISSION NUMBER, 15)
300     WRITE (6,240) N1(I)
310     FORMAY (I10X, 32MISSION-OFF TAXI MAXIMUMS PER FLIGHT =, 15) INAD 83
320     WRITE (6,250) N1(I)
330     FORMAY (I10X, 32NUMBER OF INTERVALS IN MISSION #, 15) INAD 84
340     N1 = N1(I)
350     DO 270 J = 1, N1
360     WRITE (6,260) J
370     FORMAY (I10X, 19MISSION INTERVAL NO, 15)          INAD 85
380     WRITE (6,265)
390     WRITE (6,265)

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30      NUMML(1) = NUMML(1) + 1      CALC 56
      IF (NUMML(1) .GT. 66) GO      CALC 57
      WRITE (6,70) 1, NUMML(1)      CALC 58
70      FORMAT (10X, 10HERROR SIGNAL NO. 1, 2X, 3H1 2, 15, 2X,      CALC 59
      1, 10HNUMML(1) = 15)          CALC 60
      CALL GUIDE                     CALC 601
      IM188 = 1                     CALC 61
      GO TO 170                     CALC 62
65      C      NONRANDOM MISSION SELECTION OPTION      CALC 63
      IM188 = NUMML(NRUM)           CALC 64
      NRUM = 1                      CALC 65
      IF (NRUM .GT. NUMML(NRUM)) 170, 170, 120      CALC 66
      NRUM = NUMML(1)              CALC 67
      NRUM = 0                      CALC 68
      IF (NRUM .GT. NUMML(1)) 170, 170, 150          CALC 69
      NRUM = 1                      CALC 70
      IF (NRUM .GT. NUMML(1)) 101, 101, 165          CALC 71
      NRUM = 1                      CALC 711
      GO TO 170                     CALC 712
      CALL GUIDE                     CALC 713
105     C      MISSION BREAKDOWN BY CODE      CALC 72
      X = 1  AIRCRAFT AT REST IN TAKE-OFF CONFIGURATION      CALC 73
      X = 2  TAKE-OFF TAXI          CALC 74
      X = 3  FLIGHT                 CALC 75
      X = 4  LANDING IMPACT         CALC 76
      X = 5  LANDING TAXI          CALC 77
      X = 6  TOUCH-AND-GO LANDING  CALC 78
      Y = 1  MAXIMUM OR TOUCH-AND-GO LANDING IMPACT      CALC 79
      Y = 2  MINIMUM OR TOUCH-AND-GO ONE G              CALC 80
      Y = 3  TEMPERATURE           CALC 81
      C      SELECT THE LOAD AND TEMPERATURE SEQUENCE FOR A FLIGHT FOR THIS      CALC 82
      MISSION                      CALC 83
      IL = 1                        CALC 84
      DEFINE LOAD AND TEMPERATURE FOR AIRCRAFT AT REST      CALC 85
      STRESS(1) = 0.0              CALC 86
      TEMP(1) = 1.0                CALC 87
      FORM THE TAKE-OFF TAXI LOAD SEQUENCE                  CALC 88
      DO 130 I = 1, NCT5          CALC 89
      NCT5 = NTP(1)              CALC 90
      C      SELECT A MAXIMUM TAKE-OFF TAXI LOAD            CALC 91
      CALL SEARCH (NTP(1), 1N188, 1N189, 1N190, 1N191, 1N192, 1N193, 1N194, 1N195, 1N196, 1N197, 1N198, 1N199, 1N200, 1N201, 1N202, 1N203, 1N204, 1N205, 1N206, 1N207, 1N208, 1N209, 1N210, 1N211, 1N212, 1N213, 1N214, 1N215, 1N216, 1N217, 1N218, 1N219, 1N220, 1N221, 1N222, 1N223, 1N224, 1N225, 1N226, 1N227, 1N228, 1N229, 1N230, 1N231, 1N232, 1N233, 1N234, 1N235, 1N236, 1N237, 1N238, 1N239, 1N240, 1N241, 1N242, 1N243, 1N244, 1N245, 1N246, 1N247, 1N248, 1N249, 1N250, 1N251, 1N252, 1N253, 1N254, 1N255, 1N256, 1N257, 1N258, 1N259, 1N260, 1N261, 1N262, 1N263, 1N264, 1N265, 1N266, 1N267, 1N268, 1N269, 1N270, 1N271, 1N272, 1N273, 1N274, 1N275, 1N276, 1N277, 1N278, 1N279, 1N280, 1N281, 1N282, 1N283, 1N284, 1N285, 1N286, 1N287, 1N288, 1N289, 1N290, 1N291, 1N292, 1N293, 1N294, 1N295, 1N296, 1N297, 1N298, 1N299, 1N300, 1N301, 1N302, 1N303, 1N304, 1N305, 1N306, 1N307, 1N308, 1N309, 1N310, 1N311, 1N312, 1N313, 1N314, 1N315, 1N316, 1N317, 1N318, 1N319, 1N320, 1N321, 1N322, 1N323, 1N324, 1N325, 1N326, 1N327, 1N328, 1N329, 1N330, 1N331, 1N332, 1N333, 1N334, 1N335, 1N336, 1N337, 1N338, 1N339, 1N340, 1N341, 1N342, 1N343, 1N344, 1N345, 1N346, 1N347, 1N348, 1N349, 1N350, 1N351, 1N352, 1N353, 1N354, 1N355, 1N356, 1N357, 1N358, 1N359, 1N360, 1N361, 1N362, 1N363, 1N364, 1N365, 1N366, 1N367, 1N368, 1N369, 1N370, 1N371, 1N372, 1N373, 1N374, 1N375, 1N376, 1N377, 1N378, 1N379, 1N380, 1N381, 1N382, 1N383, 1N384, 1N385, 1N386, 1N387, 1N388, 1N389, 1N390, 1N391, 1N392, 1N393, 1N394, 1N395, 1N396, 1N397, 1N398, 1N399, 1N400, 1N401, 1N402, 1N403, 1N404, 1N405, 1N406, 1N407, 1N408, 1N409, 1N410, 1N411, 1N412, 1N413, 1N414, 1N415, 1N416, 1N417, 1N418, 1N419, 1N420, 1N421, 1N422, 1N423, 1N424, 1N425, 1N426, 1N427, 1N428, 1N429, 1N430, 1N431, 1N432, 1N433, 1N434, 1N435, 1N436, 1N437, 1N438, 1N439, 1N440, 1N441, 1N442, 1N443, 1N444, 1N445, 1N446, 1N447, 1N448, 1N449, 1N450, 1N451, 1N452, 1N453, 1N454, 1N455, 1N456, 1N457, 1N458, 1N459, 1N460, 1N461, 1N462, 1N463, 1N464, 1N465, 1N466, 1N467, 1N468, 1N469, 1N470, 1N471, 1N472, 1N473, 1N474, 1N475, 1N476, 1N477, 1N478, 1N479, 1N480, 1N481, 1N482, 1N483, 1N484, 1N485, 1N486, 1N487, 1N488, 1N489, 1N490, 1N491, 1N492, 1N493, 1N494, 1N495, 1N496, 1N497, 1N498, 1N499, 1N500, 1N501, 1N502, 1N503, 1N504, 1N505, 1N506, 1N507, 1N508, 1N509, 1N510, 1N511, 1N512, 1N513, 1N514, 1N515, 1N516, 1N517, 1N518, 1N519, 1N520, 1N521, 1N522, 1N523, 1N524, 1N525, 1N526, 1N527, 1N528, 1N529, 1N530, 1N531, 1N532, 1N533, 1N534, 1N535, 1N536, 1N537, 1N538, 1N539, 1N540, 1N541, 1N542, 1N543, 1N544, 1N545, 1N546, 1N547, 1N548, 1N549, 1N550, 1N551, 1N552, 1N553, 1N554, 1N555, 1N556, 1N557, 1N558, 1N559, 1N560, 1N561, 1N562, 1N563, 1N564, 1N565, 1N566, 1N567, 1N568, 1N569, 1N570, 1N571, 1N572, 1N573, 1N574, 1N575, 1N576, 1N577, 1N578, 1N579, 1N580, 1N581, 1N582, 1N583, 1N584, 1N585, 1N586, 1N587, 1N588, 1N589, 1N590, 1N591, 1N592, 1N593, 1N594, 1N595, 1N596, 1N597, 1N598, 1N599, 1N600, 1N601, 1N602, 1N603, 1N604, 1N605, 1N606, 1N607, 1N608, 1N609, 1N610, 1N611, 1N612, 1N613, 1N614, 1N615, 1N616, 1N617, 1N618, 1N619, 1N620, 1N621, 1N622, 1N623, 1N624, 1N625, 1N626, 1N627, 1N628, 1N629, 1N630, 1N631, 1N632, 1N633, 1N634, 1N635, 1N636, 1N637, 1N638, 1N639, 1N640, 1N641, 1N642, 1N643, 1N644, 1N645, 1N646, 1N647, 1N648, 1N649, 1N650, 1N651, 1N652, 1N653, 1N654, 1N655, 1N656, 1N657, 1N658, 1N659, 1N660, 1N661, 1N662, 1N663, 1N664, 1N665, 1N666, 1N667, 1N668, 1N669, 1N670, 1N671, 1N672, 1N673, 1N674, 1N675, 1N676, 1N677, 1N678, 1N679, 1N680, 1N681, 1N682, 1N683, 1N684, 1N685, 1N686, 1N687, 1N688, 1N689, 1N690, 1N691, 1N692, 1N693, 1N694, 1N695, 1N696, 1N697, 1N698, 1N699, 1N700, 1N701, 1N702, 1N703, 1N704, 1N705, 1N706, 1N707, 1N708, 1N709, 1N710, 1N711, 1N712, 1N713, 1N714, 1N715, 1N716, 1N717, 1N718, 1N719, 1N720, 1N721, 1N722, 1N723, 1N724, 1N725, 1N726, 1N727, 1N728, 1N729, 1N730, 1N731, 1N732, 1N733, 1N734, 1N735, 1N736, 1N737, 1N738, 1N739, 1N740, 1N741, 1N742, 1N743, 1N744, 1N745, 1N746, 1N747, 1N748, 1N749, 1N750, 1N751, 1N752, 1N753, 1N754, 1N755, 1N756, 1N757, 1N758, 1N759, 1N760, 1N761, 1N762, 1N763, 1N764, 1N765, 1N766, 1N767, 1N768, 1N769, 1N770, 1N771, 1N772, 1N773, 1N774, 1N775, 1N776, 1N777, 1N778, 1N779, 1N780, 1N781, 1N782, 1N783, 1N784, 1N785, 1N786, 1N787, 1N788, 1N789, 1N790, 1N791, 1N792, 1N793, 1N794, 1N795, 1N796, 1N797, 1N798, 1N799, 1N800, 1N801, 1N802, 1N803, 1N804, 1N805, 1N806, 1N807, 1N808, 1N809, 1N810, 1N811, 1N812, 1N813, 1N814, 1N815, 1N816, 1N817, 1N818, 1N819, 1N820, 1N821, 1N822, 1N823, 1N824, 1N825, 1N826, 1N827, 1N828, 1N829, 1N830, 1N831, 1N832, 1N833, 1N834, 1N835, 1N836, 1N837, 1N838, 1N839, 1N840, 1N841, 1N842, 1N843, 1N844, 1N845, 1N846, 1N847, 1N848, 1N849, 1N850, 1N851, 1N852, 1N853, 1N854, 1N855, 1N856, 1N857, 1N858, 1N859, 1N860, 1N861, 1N862, 1N863, 1N864, 1N865, 1N866, 1N867, 1N868, 1N869, 1N870, 1N871, 1N872, 1N873, 1N874, 1N875, 1N876, 1N877, 1N878, 1N879, 1N880, 1N881, 1N882, 1N883, 1N884, 1N885, 1N886, 1N887, 1N888, 1N889, 1N890, 1N891, 1N892, 1N893, 1N894, 1N895, 1N896, 1N897, 1N898, 1N899, 1N900, 1N901, 1N902, 1N903, 1N904, 1N905, 1N906, 1N907, 1N908, 1N909, 1N910, 1N911, 1N912, 1N913, 1N914, 1N915, 1N916, 1N917, 1N918, 1N919, 1N920, 1N921, 1N922, 1N923, 1N924, 1N925, 1N926, 1N927, 1N928, 1N929, 1N930, 1N931, 1N932, 1N933, 1N934, 1N935, 1N936, 1N937, 1N938, 1N939, 1N940, 1N941, 1N942, 1N943, 1N944, 1N945, 1N946, 1N947, 1N948, 1N949, 1N950, 1N951, 1N952, 1N953, 1N954, 1N955, 1N956, 1N957, 1N958, 1N959, 1N960, 1N961, 1N962, 1N963, 1N964, 1N965, 1N966, 1N967, 1N968, 1N969, 1N970, 1N971, 1N972, 1N973, 1N974, 1N975, 1N976, 1N977, 1N978, 1N979, 1N980, 1N981, 1N982, 1N983, 1N984, 1N985, 1N986, 1N987, 1N988, 1N989, 1N990, 1N991, 1N992, 1N993, 1N994, 1N995, 1N996, 1N997, 1N998, 1N999, 1N1000, 1N1001, 1N1002, 1N1003, 1N1004, 1N1005, 1N1006, 1N1007, 1N1008, 1N1009, 1N1010, 1N1011, 1N1012, 1N1013, 1N1014, 1N1015, 1N1016, 1N1017, 1N1018, 1N1019, 1N1020, 1N1021, 1N1022, 1N1023, 1N1024, 1N1025, 1N1026, 1N1027, 1N1028, 1N1029, 1N1030, 1N1031, 1N1032, 1N1033, 1N1034, 1N1035, 1N1036, 1N1037, 1N1038, 1N1039, 1N1040, 1N1041, 1N1042, 1N1043, 1N1044, 1N1045, 1N1046, 1N1047, 1N1048, 1N1049, 1N1050, 1N1051, 1N1052, 1N1053, 1N1054, 1N1055, 1N1056, 1N1057, 1N1058, 1N1059, 1N1060, 1N1061, 1N1062, 1N1063, 1N1064, 1N1065, 1N1066, 1N1067, 1N1068, 1N1069, 1N1070, 1N1071, 1N1072, 1N1073, 1N1074, 1N1075, 1N1076, 1N1077, 1N1078, 1N1079, 1N1080, 1N1081, 1N1082, 1N1083, 1N1084, 1N1085, 1N1086, 1N1087, 1N1088, 1N1089, 1N1090, 1N1091, 1N1092, 1N1093, 1N1094, 1N1095, 1N1096, 1N1097, 1N1098, 1N1099, 1N1100, 1N1101, 1N1102, 1N1103, 1N1104, 1N1105, 1N1106, 1N1107, 1N1108, 1N1109, 1N1110, 1N1111, 1N1112, 1N1113, 1N1114, 1N1115, 1N1116, 1N1117, 1N1118, 1N1119, 1N1120, 1N1121, 1N1122, 1N1123, 1N1124, 1N1125, 1N1126, 1N1127, 1N1128, 1N1129, 1N1130, 1N1131, 1N1132, 1N1133, 1N1134, 1N1135, 1N1136, 1N1137, 1N1138, 1N1139, 1N1140, 1N1141, 1N1142, 1N1143, 1N1144, 1N1145, 1N1146, 1N1147, 1N1148, 1N1149, 1N1150, 1N1151, 1N1152, 1N1153, 1N1154, 1N1155, 1N1156, 1N1157, 1N1158, 1N1159, 1N1160, 1N1161, 1N1162, 1N1163, 1N1164, 1N1165, 1N1166, 1N1167, 1N1168, 1N1169, 1N1170, 1N1171, 1N1172, 1N1173, 1N1174, 1N1175, 1N1176, 1N1177, 1N1178, 1N1179, 1N1180, 1N1181, 1N1182, 1N1183, 1N1184, 1N1185, 1N1186, 1N1187, 1N1188, 1N1189, 1N1190, 1N1191, 1N1192, 1N1193, 1N1194, 1N1195, 1N1196, 1N1197, 1N1198, 1N1199, 1N1200, 1N1201, 1N1202, 1N1203, 1N1204, 1N1205, 1N1206, 1N1207, 1N1208, 1N1209, 1N1210, 1N1211, 1N1212, 1N1213, 1N1214, 1N1215, 1N1216, 1N1217, 1N1218, 1N1219, 1N1220, 1N1221, 1N1222, 1N1223, 1N1224, 1N1225, 1N1226, 1N1227, 1N1228, 1N1229, 1N1230, 1N1231, 1N1232, 1N1233, 1N1234, 1N1235, 1N1236, 1N1237, 1N1238, 1N1239, 1N1240, 1N1241, 1N1242, 1N1243, 1N1244, 1N1245, 1N1246, 1N1247, 1N1248, 1N1249, 1N1250, 1N1251, 1N1252, 1N1253, 1N1254, 1N1255, 1N1256, 1N1257, 1N1258, 1N1259, 1N1260, 1N1261, 1N1262, 1N1263, 1N1264, 1N1265, 1N1266, 1N1267, 1N1268, 1N1269, 1N1270, 1N1271, 1N1272, 1N1273, 1N1274, 1N1275, 1N1276, 1N1277, 1N1278, 1N1279, 1N1280, 1N1281, 1N1282, 1N1283, 1N1284, 1N1285, 1N1286, 1N1287, 1N1288, 1N1289, 1N1290, 1N1291, 1N1292, 1N1293, 1N1294, 1N1295, 1N1296, 1N1297, 1N1298, 1N1299, 1N1300, 1N1301, 1N1302, 1N1303, 1N1304, 1N1305, 1N1306, 1N1307, 1N1308, 1N1309, 1N1310, 1N1311, 1N1312, 1N1313, 1N1314, 1N1315, 1N1316, 1N1317, 1N1318, 1N1319, 1N1320, 1N1321, 1N1322, 1N1323, 1N1324, 1N1325, 1N1326, 1N1327, 1N1328, 1N1329, 1N1330, 1N1331, 1N1332, 1N1333, 1N1334, 1N1335, 1N1336, 1N1337, 1N1338, 1N1339, 1N1340, 1N1341, 1N1342, 1N1343, 1N1344, 1N1345, 1N1346, 1N1347, 1N1348, 1N1349, 1N1350, 1N1351, 1N1352, 1N1353, 1N1354, 1N1355, 1N1356, 1N1357, 1N1358, 1N1359, 1N1360, 1N1361, 1N1362, 1N1363, 1N1364, 1N1365, 1N1366, 1N1367, 1N1368, 1N1369, 1N1370, 1N1371, 1N1372, 1N1373, 1N1374, 1N1375, 1N1376, 1N1377, 1N1378, 1N1379, 1N1380, 1N1381, 1N1382, 1N1383, 1N1384, 1N1385, 1N1386, 1N1387, 1N1388, 1N1389, 1N1390, 1N1391, 1N1392, 1N1393, 1N1394, 1N1395, 1N1396, 1N1397, 1N1398, 1N1399, 1N1400, 1N1401, 1N1402, 1N1403, 1N1404, 1N1405, 1N1406, 1N1407, 1N1408, 1N1409, 1N1410, 1N1411, 1N1412, 1N1413, 1N1414, 1N1415, 1N1416, 1N1417, 1N1418, 1N1419, 1N1420, 1N1421, 1N1422, 1N1423, 1N1424, 1N1425, 1N1426, 1N1427, 1N1428, 1N1429, 1N1430, 1N1431, 1N1432, 1N1433, 1N1434, 1N1435, 1N1436, 1N1437, 1N1438, 1N1439, 1N1440, 1N1441, 1N1442, 1N1443, 1N1444, 1N1445, 1N1446, 1N1447, 1N1448, 1N1449, 1N1450, 1N1451, 1N1452, 1N1453, 1N1454, 1N1455, 1N1456, 1N1457, 1N1458, 1N1459, 1N1460, 1N1461, 1N1462, 1N1463, 1N1464, 1N1465, 1N1466, 1N1467, 1N1468, 1N1469, 1N1470, 1N1471, 1N1472, 1N1473, 1N1474, 1N1475, 1N1476, 1N1477, 1N1478, 1N1479, 1N1480, 1N1481, 1N1482, 1N1483, 1N1484, 1N1485, 1N1486, 1N1487, 1N1488, 1N1489, 1N1490, 1N1491, 1N1492, 1N1493, 1N1494, 1N1495, 1N1496, 1N1497, 1N1498, 1N1499, 1N1500, 1N1501, 1N1502, 1N1503, 1N1504, 1N1505, 1N1506, 1N1507, 1N1508, 1N1509, 1N1510, 1N1511, 1N1512, 1N1513, 1N1514, 1N1515, 1N1516, 1N1517, 1N1518, 1N1519, 1N1520, 1N1521, 1N1522, 1N1523, 1N1524, 1N1525, 1N1526, 1N1527, 1N1528, 1N1529, 1N1530, 1N1531, 1N1532, 1N1533, 1N1534, 1N1535, 1N1536, 1N1537, 1N1538, 1N1539, 1N1540, 1N1541, 1N1542, 1N1543, 1N1544, 1N1545, 1N1546, 1N1547, 1N1548, 1N1549, 1N1550, 1N1551, 1N1552, 1N1553, 1N1554, 1N1555, 1N1556, 1N1557, 1N1558, 1N1559, 1N1560, 1N1561, 1N1562, 1N1563, 1N1564, 1N1565, 1N1566, 1N1567, 1N1568, 1N1569, 1N1570, 1N1571, 1N1572, 1N1573, 1N1574, 1N1575, 1N1576, 1N1577, 1N1578, 1N1579, 1N1580, 1N1581, 1N1582, 1N1583, 1N1584, 1N1585, 1N1586, 1N1587, 1N1588, 1N1589, 1N1590, 1N1591, 1N1592, 1N1593, 1N1594, 1N1595, 1N1596, 1N1597, 1N1598, 1N1599, 1N1600, 1N1601, 1N1602, 1N1603, 1N1604, 1N1605, 1N1606, 1N1607, 1N1608, 1N1609, 1N1610, 1N1611, 1N1612, 1N1613, 1N1614, 1N1615, 1N1616, 1N1617, 1N1618, 1N1619, 1N1620, 1N1621, 1N1622, 1N1623, 1N1624, 1N1625, 1N1626, 1N1627, 1N1628, 1N1629, 1N1630, 1N1631, 1N1632, 1N1633, 1N1634, 1N1635, 1N1636, 1N1637, 1N1638, 1N1639, 1N1640, 1N1641, 1N1642, 1N1643, 1N1644, 1N1645, 1N1646, 1N1647, 1N1648, 1N1649, 1N1650, 1N1651, 1N1652, 1N1653, 1N1654, 1N1655, 1N1656, 1N1657, 1N1658, 1N1659, 1N1660, 1N1661, 1N1662, 1N1663, 1N1664, 1N1665, 1N1666, 1N1667, 1N1668, 1N1669, 1N1670, 1N1671, 1N1672, 1N1673, 1N1674, 1N1675, 1N1676, 1N1677, 1N1678, 1N1679, 1N1680, 1N1681, 1N1682, 1N1683, 1N1684, 1N1685, 1N1686, 1N1687, 1N1688, 1N1689, 1N1690, 1N1691, 1N1692, 1N1693, 1N1694, 1N1695, 1N1696, 1N1697, 1N1698, 1N1699, 1N1700, 1N1701, 1N1702, 1N1703, 1N1704, 1N1705, 1N1706, 1N1707, 1N1708, 1N1709, 1N1710, 1N1711, 1N1712, 1N1713, 1N1714, 1N1715, 1N1716, 1N1717, 1N1718, 1N1719, 1N1720, 1N1721, 1N1722, 1N1723, 1N1724, 1N1725, 1N1726, 1N1727, 1N17
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BOOROUTINE CALC 74774 DP/61 FTR 8.00P33 05/13/74 16:23:17. PAGE 3

115 C GO TO 160
116 SELECT THE RANDOM MISSION TIME
117 NPOS = 0
118 DO 163 I = 1, NHTS
119 NPOS = MPAC(I,INTS,J) + NPOS
120 I = NHTS
121 NPOS = N + NPOS + 1
122 N = 0
123 DO 164 I = 1, NHTS
124 N = MPAC(I,INTS,J) + N
125 IF (N - SEL - N) 165, 105, 164
126 CONTINUE
127 MPAC(I,INTS,J) = MPAC(I,INTS,J) - 1
128 IF (MPAC(I,INTS,J)) 166, 107, 1071
129 WRITE (6,107) I, MPAC(I,INTS,J)
130 FORWAY (105, 108) SIGNAL NO. 2, 4X, 3H = 15, 4X,
131 10HMPAC(I,INTS,J) = 15
132 INT = I
133 NCTB = MPAC(I,INTS,J)
134 DO 200 I = 1, NCTB
135 SELECT A MAXIMUM FLIGHT LOG AND TEMPERATURE
136 CALL BEARS (MPAC(I,INTS,J), MPAC(I,INTS,J), INTS,
137 I, J, 31, INT)
138 IL = IL + 1
139 STRESS(IL) = SPAC(MISS,J,INT)
140 DO 201 (190, 200), MTEMP(IL,INTS)
141 MTEMP(IL) = IL
142 DO 201 210
143 CALL BEARS (MPAC(I,INTS,J), MPAC(I,INTS,J), INTS,
144 I, J, 35, INT)
145 MTEMP(IL) = MPAC(I,INTS,J,INT)
146 SELECT A MINIMUM FLIGHT LOG AND TEMPERATURE
147 FROM COMBINED NEGATIVE AND ONE G LOAD FUNCTIONS
148 MNG = MPAC(I,INTS,J) + MPAC(I,INTS,J)
149 MNTJ = MPAC(I,INTS,J)
150 DO 212 K = 1, MNTJ
151 MNG(K) = MPAC(I,INTS,J,K)
152 MNTJ(K) = MPAC(I,INTS,J,K)
153 DO 213 N = 1, MNG(J)
154 MNG(K+MNTJ) = MPAC(I,INTS,J,K)
155 MNG(K+MNTJ) = SPAC(MISS,J,K)
156 CALL BEARS (MNG, MNG(I), INTS,
157 I, J, 38, INT)
158 IF (INT = MPAC(I,INTS,J)) 216, 216, 216
159 MPAC(I,INTS,J,INT) = MPAC(I,INTS,J,INT) - 1
160 DO 219
161 MNT = INT - MPAC(I,INTS,J)
162 MPAC(I,INTS,J,INT) = MPAC(I,INTS,J,INT) + 1
163 IL = IL + 1
164 STRESS(IL) = MNG(I)
165 DO 220 (220, 219), MTEMP(IL,INTS)
166 MTEMP(IL) = IL
167 DO 220 220
168 CALL BEARS (MPAC(I,INTS,J), MPAC(I,INTS,J), INTS,
169 I, J, 35, INT)
170 MTEMP(IL) = MPAC(I,INTS,J,INT)
171 CALC1028
172 CALC1030
173 CALC1032
174 CALC1034
175 CALC1036
176 CALC1038
177 CALC1040
178 CALC1042
179 CALC1044
180 CALC1046
181 CALC1048
182 CALC1050
183 CALC1052
184 CALC1054
185 CALC1056
186 CALC1058
187 CALC1060
188 CALC1062
189 CALC1064
190 CALC1066
191 CALC1068
192 CALC1070
193 CALC1072
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340 FORHAY(120, F10.0, F10.0, 120, F10.0, F10.0, F10.0, F10.0)CALC107
IF (NIMPLY - IMPLY) 350, 360, 360
350 SUPPLY = SUPPLY + 1
GO TO 10
360 CALL SUBDE
RETURN
END


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SUBROUTINE BEAR2 (MNT, NSEG, MB, MC, MY,
1 INT)
SUBROUTINE FOR LOCATING THE INTERVAL ASSOCIATED WITH THE
RANDOM LOAD ON THE PREVIOUS SELECTION
2
3 COMPUTE THE INTERVAL FOR THE RANDOM SELECTION
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	SUBROUTINE PAGE NO		
5	SUBROUTINE FOR NUMBERING THE PAGES AND IDENTIFYING THE RUN		PAGE 1
	(COMMON P1000), (A12345)		PAGE 2
	PRINT (A, P1000)		PAGE 3
	END		PAGE 4
5	SUBROUTINE FOR IDENTIFYING THE RUN		PAGE 5
	IDENTIFY (A1000, IDENT), (A1000, MONTH)		PAGE 6
	IDENTIFY (A1000, IDENT), (A1000, MONTH)		PAGE 7
10	FORMAL (A1000, A1000, MONTH, DAY, YEAR, MPAGE)		PAGE 8
	FORMAL (A1000, A1000, MONTH, DAY, YEAR, MPAGE)		PAGE 9
10	FORMAL (A1000, A1000, MONTH, DAY, YEAR, MPAGE)		PAGE 10
	FORMAL (A1000, A1000, MONTH, DAY, YEAR, MPAGE)		PAGE 11
	END		PAGE 12